AMD

ATX Reference Design for AMD-640™ Chipset

Smoky Mountain 266 Technical Specification

Publication # **21264**	Rev: **C**	Amendment/**0**
Issue Date: **June 1997**		

Contents

List of Figures

List of Tables

1

Motherboard Description

1.1 Overview

The AMD-640™ chipset motherboard (code named AMD Smoky Mountain motherboard) is a Socket 7-compatible design with optimized support for the AMD-K5™ and AMD-K6™ MMX™ Enhanced processors. The motherboard supports the following set of features:

- 12-in x 9.6-in ATX form factor
- Zero insertion force (ZIF) socket (Socket 7)
- Processor clock speeds from 75 MHz to 366 MHz
- AMD-640 chipset
- Four standard 72-pin SIMM sockets supporting up to 128 Mbytes of non-parity, fast-page mode or extended data out (EDO) DRAM
- 512 Kbytes or 1 MByte of direct-mapped L2 cache memory using two, four 32 Kbit by 32 or 64 Kbit by 32, 7-ns PBSRAMS
- PCI bus-mastering IDE controller supporting up to four IDE devices (either hard drives or CD-ROMs)
- Microsoft® Windows®95-ready Plug-N-Play
- Three PCI, two ISA, and one shared PCI/ISA expansion slots (the shared PCI/ISA slot is ISA-only when the motherboard uses the S3 ViRGE video controller)

- AMD 29F002T 2-Mbyte flash memory chip for flash BIOS
- Award *Elite*BIOS, version 4.1 in Reference Design
- SMC FDC37C669 PC 95/96-compatible Super I/O controller containing the following features:
  - Flexible disk support
  - One 16550-compatible serial port
  - One IrDA-, ASKIR-, and HPSIR-compatible infrared (IR) port
  - One EPP/ECP-capable parallel port
- Two universal serial bus (USB) interfaces that are USB 1.0- and Intel Universal HCI 1.1-compatible
- Integrated ViRGE, Trio64V+, or Trio64V S3 graphics controller with up to 4Mbytes of 50-ns, EDO DRAM video memory, supporting SVGA graphics at resolutions up to 1600 x 1200
- Integrated Crystal CS4238, CS4236, or CS4237 stereo audio controller providing MPU-401 and SoundBlaster compatibility and either SRS 3-D (CS4237) or Q-Sound 3-D (CS4238) audio
- Standard ATX backpanel I/O connector header provides the following:
  - One VGA monitor connector
  - One each PS/2-style mouse and keyboard connector
  - One 9-pin DB9 serial port connector
  - Two USB interface connectors
  - One 25-pin DB25 parallel port connector
  - One 15-pin DB15 MIDI/joystick connector
  - One each stereo line input, monaural microphone input, and stereo headphone output connector
- Supports advanced power management (APM)

1.2 Compatibility

The AMD Smoky Mountain motherboard conforms to the following system-level compatibility requirements:

- 16-bit ISA mechanical and electrical compatibility
- 32-bit PCI 2.1 mechanical and electrical compatibility
- Hardware register compatibility for the following system board programmable devices:
  - DMA controller
  - Interrupt controller
  - Parallel port
  - Serial port
  - Keyboard controller
  - Flexible disk controller
  - Timer
  - Clock
  - Static RAM
  - Video
- Plug compatibility at the keyboard, auxiliary, serial port, parallel port, USB, and audio connectors

1.2.1 Microprocessor Compatibility

The AMD Smoky Mountain motherboard supports the following processors:

- AMD-K5 processors—all models (PR75, PR100, PR120, PR133, PR166, PR200)
- AMD-K6 processors—all models
- Other Socket 7 processors

1.2.2 Operating System Compatibility

The AMD Smoky Mountain motherboard successfully executes the software operating systems and environment managers listed in Table 1-1.

Table 1-1. Supported Operating Environments

Operating Environment	Version
DOS	5.x & 6.x
Microsoft Windows	3.11
Windows 95	1.0
Windows NT	3.5, 3.51, 4.0
IBM OS/2	3.0
SCO UNIX	V3.2 Release 4.2
SCO UNIX ODT	X11, Release 5

1.3 Human Factors

Some human factors depend entirely on the overall system environment and have little or nothing to do with the motherboard—for example, acoustical noise. The human factors affected directly by the motherboard are described below.

1.3.1 Audio Quality

The audio circuitry provides a 70-dB signal-to-noise ratio over a 20-Hz to 20-KHz frequency range. However, the internal speaker is incapable of reproducing the full frequency range. The audio circuitry uses the internal speaker until a headphone/speaker is plugged into the external jack. The motherboard includes three connectors accessible from the rear panel—line in, headphone/speaker out, and microphone.

1.3.2 Keyboard

The AMD Smoky Mountain motherboard is designed to function with the PS/2-compatible, 101- (US) or 102- (international) key enhanced keyboard. Different versions of this keyboard are available for specific linguistic or regional needs.

1.3.3 Video

The SVGA video subsystem provides different vertical refresh rates for a variety of display monitors. Generally, higher refresh rates result in less display flicker.

1.3.4 Configuration

General motherboard and adapter board configuration is performed through special hardware, firmware, and software provisions known as Plug-N-Play (PnP). The PnP system includes the following:

- Special hardware registers that control configuration options
- Firmware provisions in POST to transfer configuration register values from non-volatile static RAM to the registers
- Setup software used to select configuration choices and store resulting values in the static RAM

The setup software allows automatic configuration of the system options in most situations and allows selection of options using menu-driven software (with help provisions) when the user wants manual intervention.

1.3.5 Connector Keying

Connectors and cables (internal and external) to the system unit are keyed to prevent incorrect installation. Icons on the rear panel identify each of the connectors.

1.4 Deliverable Configurations

The configurations listed in Table 1-2 are initially available for the AMD Smoky Mountain motherboard.

Table 1-2. Available Configurations

Assembly Number	Feature Set
1000007-001	S3 ViRGE w/2 Mbytes; 3 ISA Slots; 3 PCI Slots; Crystal 4238 Audio; 512-KBytes cache
1000007-002	no video; no audio; 2 ISA Slots; 1 shared ISA/PCI slot; 3 PCI Slots; 512-Kbytes cache

1.5 Operating Environment

The AMD Smoky Mountain motherboard is designed to operate within certain environmental limits described as follows.

1.5.1 Temperature, Humidity, and Barometric Pressure

The motherboard is designed to operate in an environment with a limited capacity for heating and air conditioning. The temperature and humidity limits are listed in Table 1-3.

Table 1-3. Termperature, Humidity, and Barometric Pressure Limits

Environmental Parameter	Limits
Operating Temperature	10°C to 50°C, 10°C change per hour
Operating Humidity	20°C to 80% relative humidity, 15-% change per hour
Storage Temperature	−10°C to +50°C, 15°C change per hour
Storage Humidity	10% to 90% relative humidity without condensation
Barometric Pressure (Operating, Storage, and Transit)	105 to 69,000 Pascal (up to 9850 ft above sea level)

1.5.2 Shock and Vibration

Shock and vibration specifications are divided into two categories—operating and non-operating. The AMD Smoky

Mountain motherboard design limits for these two kinds of shock and vibration are described below. Testing is currently underway.

Operating Shock and Vibration

The motherboard does not experience hard errors when subjected to the following shock and vibration while operating.

Trapezoidal or Square Shock Pulse. One 10-g shock pulse within a 10-ms period in each of the positive and negative directions along the three mutually perpendicular axes.

Vibration. A sinusoidal sweep from 3Hz to 150Hz and back to 3Hz with a constant 0.25-g input (0 to peak) in the positive and negative directions along the three mutually perpendicular axes. A dwell time of 15 minutes is applied at any frequency on any axis in which vigorous or resonant excitation of the motherboard or component parts occurs.

Non-Operating Shock and Vibration

The unpacked motherboard operates correctly after being subjected to the following shocks and vibration while not operating.

Spike Shock Pulse (Velocity Change). A velocity change of 45 in/sec in 3.75 ms (approximately 65 g) in the motherboard's base position.

Trapezoidal or Square Shock Pulse. One 30-g shock pulse within an 8-ms period in each of the positive and negative directions along the three mutually perpendicular axes.

Vibration. A sinusoidal sweep from 3Hz to 150Hz and back to 3Hz with a constant 0.5-g input (0 to peak) in the positive and negative directions along the three mutually perpendicular axis. A dwell time of 15 minutes is applied at any frequency on any axis in which vigorous or resonant excitation of the motherboard or component parts occurs.

1.6 Regulatory Compliance

Testing for the following electromagnetic interference (EMI) standards certifications is currently underway:

- FCC Class B—Title 47 of the Code of Federal Regulations (CFR) Parts 2 and 15, Subpart B, pertaining to unintentional radiators

1.7 Reference Documents

The following reference documents are related to the design of the AMD Smoky Mountain motherboard.

1.7.1 AMD Documentation

- AMD-K6™ MMX™ Enhanced Processor Data Sheet, Revision B, order# 20695
- AMD-K5™ Microprocessor Design Kit, order# 19764
- AMD-640™ System Controller Data Sheet, order# 21090A
- AMD-645™ Peripheral Bus Controller Data Sheet, order# 21095A
- AMD K86 Family BIOS and Software Tools Developers Guide, order# 21062
- AMD Processor Recognition Application Note, order# 20734
- Am29F002T/Am20F002B 2 Megabit (262,144 x 8-Bit) CMOS 5.0 Volt-only, Sector Architecture Flash Memory, Rev: A, March 1996, order# 20818.

1.7.2 Vendor Reference Documents

- Crystal CS4236-KQ, Single-Chip Audio System, January 1996
- SMC FDC37C669, PC 95/96-Compatible Super I/O Floppy Disk controller with Infrared Support, Rev. 7/13/95
- S3 Trio64V+ Integrated Graphics/Video Accelerator, July 1995
- S3 ViRGE Integrated 3D Accelerator, February 1996

2

Component Functional Description

2.1 Processor

The AMD Smoky Mountain motherboard is designed to support 3.3- to 3.52-V single-voltage processors and 1.1- to 3.5-V core/3.3-V or 3.52-V I/O dual-voltage processors. A switching voltage regulator provides up to 15 A operating current to the processor core, and a linear voltage regulator provides 4 A operating current to the processor I/O pins, chipset, and clock generator. The switch settings needed to select the proper voltage and operating frequencies for the processors are discussed in detail in Section 3.1 and Section 3.2. The various processors supported are described below.

2.1.1 AMD-K5 Processor

All models and speeds of the AMD-K5 processor are supported. The AMD-K5 processor implements advanced design techniques such as instruction pre-decoding, single-cycle internal RISC operations, parallel execution units, out-of-order issue and completion, register renaming, data forwarding, and dynamic branch prediction. The features of the AMD-K5 processor are as follows:

- Four-issue superscalar core with six parallel execution units arranged in a five-stage pipeline
- 16-Kbyte, dual-tagged, four-way, set-associative instruction cache
- 8-Kbyte, dual-tagged, dual-ported with four banks, four-way set-associative, writeback data cache
- Full, out-of-order speculative execution and completion
- Dynamic cache line-oriented branch prediction with 1-Kbyte branch predictions and low 3-cycle branch mispredict penalty
- Integrated, high-performance floating-point unit (FPU) with low-latency add/multiply and single-cycle issue
- Static clock control with phase lock loop (PLL) circuitry
- Fully compatible system management mode (SMM) for lower power consumption
- 64-bit Pentium-compatible bus and system interface in a 296-pin SPGA package
- Compatible with existing Pentium (P54C) support infrastructure and system designs
- Fully compatible with the Microsoft Windows operating systems and the large installed library of x86 software

2.1.2 AMD-K6™ MMX™ Enhanced Processor

The AMD Smoky Mountain motherboard supports all models and speeds of the AMD-K6 MMX enhanced processor. As the next generation in the AMD K86™ family of x86-compatible processors, the innovative AMD-K6 processor brings leading-edge superscalar RISC performance to PC systems running the extensive installed base of industry-standard x86 software. In addition, its socket 7 compatible, 321-pin Ceramic Pin Grid Array (CPGA) package enables the AMD-K6 processor to leverage a mature and cost-effective infrastructure to deliver a superior price/performance PC solution. To provide state-of-the-art performance, the AMD-K6 incorporates the innovative and efficient RISC86® microarchitecture, large level-one caches (32-Kbyte dual-ported data cache, 32-Kbyte instruction cache with predecode data), a powerful IEEE 754-compatible floating-point execution unit, and a high-performance industry-standard multimedia extensions (MMX) execution unit. These techniques have been combined to enhance both 16-bit and 32-bit software

performance, providing exceptional performance for both today's and tomorrow's power-hungry PC applications.

The AMD-K6 MMX enhanced processor's RISC86 microarchitecture is a decoupled decode/execution superscalar design that implements state-of-the-art computer science techniques targeted at enhanced performance and full x86 binary software compatibility. Advanced design techniques implemented in the AMD-K6 MMX enhanced processor include multiple x86 instruction decode, single-clock internal RISC operations, seven execution units that support superscalar operation, out-of-order execution, data forwarding, speculative execution, and register renaming. In addition, the processor supports the most advanced branch prediction logic by implementing an 8192-entry branch history table, the industry's only branch target cache, and a return address stack, which combine to deliver better than a 95% prediction rate. These design techniques enable the AMD-K6 MMX enhanced processor to issue, execute, and retire multiple x86 instructions per clock, resulting in excellent scaleable performance.

The AMD-K6 MMX enhanced processor is fully x86 binary code compatible. A focused and robust compatibility effort has been undertaken, including a rigorous design methodology, comprehensive boundary condition testing, thorough evaluations with industry-standard test tools, and 3rd party compatibility verification. AMD's extensive experience through four generations of x86 processors has been carefully integrated into the AMD-K6 MMX enhanced processor to ensure complete compatibility with Windows 95, Windows 3.x, Windows NT™, DOS, OS/2, Unix, Solaris, NetWare®, Vines, and other leading x86 operating systems and applications. The AMD-K6 MMX enhanced processor is Socket 7 compatible and fits within the AC, DC, power, and thermal specifications of the Pentium processor. This allows the AMD-K6 MMX enhanced processor to be quickly and easily integrated into a mature and cost-effective industry standard infrastructure of motherboards, chipsets, power supplies, and thermal designs.

The features of the AMD-K6 processor are as follows:

- High-performance RISC86 superscalar microarchitecture
  - Seven parallel execution units
  - Multiple sophisticated x86-to-RISC86 instruction decoders
  - Advanced two-level branch prediction
  - Speculative execution
  - Out-of-order execution
  - Register renaming and data forwarding
  - Issues up to six RISC86 instructions per clock
- Large on-chip L1 caches
  - 32-Kbyte instruction cache with predecode cache
  - 32-Kbyte writeback dual-ported data cache (MESI protocol)
- High-performance, IEEE 754-compatible floating-point unit
- MMX-capable, high-performance, industry-standard multimedia technology
- 321-pin ceramic pin grid array (CPGA) package (Socket 7-compatible)
- Compatible system management mode (SMM)
- IEEE 1149.1 boundary scan
- Full x86 binary software compatibility

2.1.3 Other Processors

The AMD Smoky Mountain motherboard also supports other Socket 7 processors.

2.2 Chipset

The AMD Smoky Mountain motherboard uses the AMD-640 Chipset. The AMD-640 Chipset is a high-performance, cost-effective chipset for the implementation of PCI/ISA personal computer systems based on the 64-bit AMD-K5, AMD-K6, and other Socket 7 super-scalar processors. Characteristics that distinguish the AMD-640 Chipset chipset from other chipsets include:

- Deep write posting and read prefetch buffers
- Error detection and correction logic
- L1 writeback forwarding to PCI initiator read to minimize PCI read latency
- L1 writeback merging with PCI initiator post write to minimize DRAM utilization
- 64-bit or 32-bit DRAM data width in arbitrary mixed combinations
- Enhanced IDE bus-mastering controller
- Future support for common architecture via distributed DMA
- Universal serial bus (USB) controller

The AMD-640 Chipset chipset consists of the AMD-640 System Controller CPU-to-PCI interface and the AMD-645 Peripheral Bus Controller PCI-to-ISA interface.

2.2.1 The AMD-640 System Controller

The AMD-640 System Controller forms a bridge between the Socket 7-class processor running at bus clock speeds up to 66 MHz and the PCI bus operating at up to 33 MHz. The AMD-640 System Controller also provides a high-performance 64-bit DRAM controller and an integrated L2 cache controller. The AMD-640 System Controller is provided in a 328-pin BGA package. For detailed information on the AMD-640 System Controller, see *The AMD-640 System Controller Data Sheet*, order# 21090.

2.2.2 The AMD-645 Peripheral Bus Controller

The AMD-645 Peripheral Bus Controller forms a bridge between the PCI bus and the ISA bus. The AMD-645 Peripheral Bus Controller also provides an enhanced master-mode IDE controller, a real-time clock, two 8259-compatible interrupt controllers configured as a master and a slave, a USB controller, a keyboard/mouse controller, and power management. The AMD-645 Peripheral Bus Controller is provided in a 208-pin PQFP package. For detailed information on the AMD-645 Peripheral Bus Controller, see *The AMD-645 Peripheral Bus Controller Data Sheet*, order# 21095.

USB Controller

The USB controller is USB v1.0- and Intel Universal HCI v1.1-compatible. The controller includes a root hub with two function ports, each with built-in physical layer transceivers. The two features ports are available for use in J4, a stacked USB connector (see Figure 3-1 on page 36 and Figure 3-3 on page 39). USB port 0 is the bottom half of J4 and port 1 is the top half. The controller also provides legacy y keyboard and PS/2 mouse support. Figure 2-1 shows the pinouts of the USB port connector.

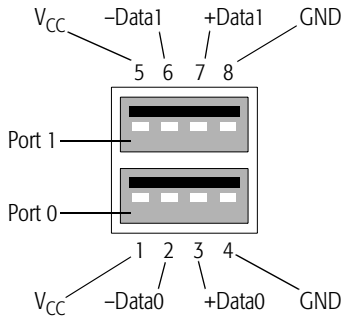


Figure 2-1. USB Port 0 and Port 1 Pinouts

Keyboard/Mouse Controller

The keyboard/mouse controller is a standard 8742-compatible implementation. J3 is the stacked keyboard/mouse connector (see Figure 3-1 on page 36 and Figure 3-3 on page 39). The keyboard connector is the top half of J3 and the mouse/auxiliary device connector is the bottom half. Figure 2-2 shows the pinouts for the keyboard/mouse connector.

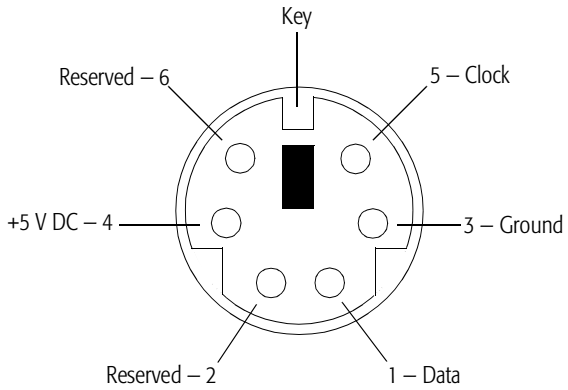


Figure 2-2. Keyboard/Mouse Connector Pinouts

2.3 SMC FDC37C669 Super I/O Controller

The SMC FCD37C669 super I/O controller provides the following functions:

- A flexible disk controller
- One NS16C550-compatible serial port
- One infrared port
- One IEEE 1284-compatible (EPP/ECP) parallel port

2.3.1 NS16C550-Compatible Serial Port

The serial port implementation is compatible with the NS16C550 UART and contains a 16-byte send/receive FIFO. The serial port supports transfer rates up to 460,800 baud. The serial port is contained in the bottom half of the stacked serial/parallel connector, J9 (see Figure 3-1 on page 36). One 9-pin DB9 serial connector is provided. The pinout diagram for the serial connector is shown in Figure 2-3. The second serial port is used as an IR port on the AMD Smoky Mountain motherboard.

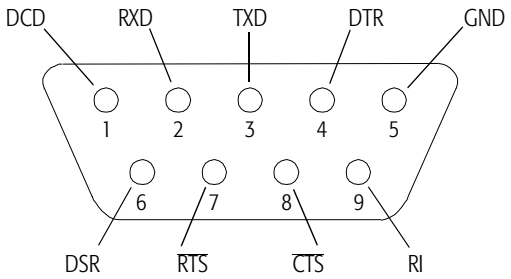


Figure 2-3. DB9 Serial Connector Pinouts

2.3.2 Infrared Port

The AMD Smoky Mountain motherboard has a 5-pin header that can be used to add an IR interface in the cabinet. The IrDA, amplitude shift keyed IR (ASKIR), and HPSIR standards are supported. The IR connector is J24 (see Figure 3-1 on page 36). The pinout diagram for the IR connector is shown in Figure 2-4.

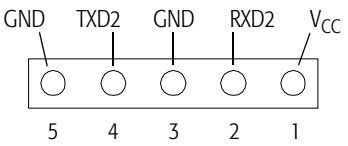


Figure 2-4. Infrared Port Pinouts

2.3.3 Parallel Port

The AMD Smoky Mountain motherboard parallel port implementation is IEEE 1284-compatible supporting both EPP and ECP. The parallel port is contained in the top half of the stacked serial/parallel connector, J9 (see Figure 3-1 on page 36). The pinout diagram for the parallel port is shown in Figure 2-5.

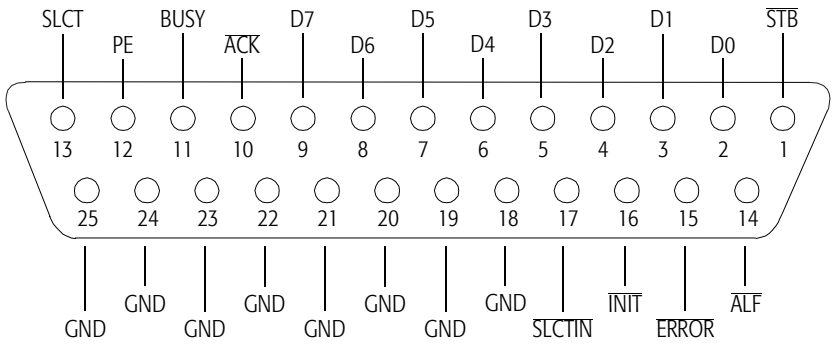


Figure 2-5. Parallel Port Pinouts

2.4 Memory

The following sections describe the system memory, flash BIOS, and the L2 cache configurations for the AMD Smoky Mountain motherboard.

2.4.1 System Memory

Memory modules specified for the AMD Smoky Mountain motherboard are 72-pin, 60-ns, non-parity, EDO SIMMs. Memory configurations are based on the following SIMM sizes:

- 4Mbyte—1M x 32 bits
- 8Mbyte—2M x 32 bits
- 16Mbyte—4M x 32 bits
- 32Mbyte—8M x 32 bits

The AMD Smoky Mountain motherboard has four SIMM sockets, labeled S1–S4 (see Figure 3-1 on page 36). For optimized memory performance, SIMMs should be populated in pairs, with sockets 1 and 2 forming one pair and sockets 3 and 4 forming the other pair. Non-paired SIMMs can be used in sockets S1 or S3, but not in S2 or S4. Sockets can be populated in any order.

Memory Configurations

Table 2-1 lists representative SIMM combinations for various memory configurations.

Table 2-1. SIMM Configuratons[1]

Total (Mbytes)	Number of SIMMs	SIMMs 1 & 2 (Mbytes)	SIMMs 3 & 4 (Mbytes)
4	1	4[2]	
8	2	8[3]	
16	2	16	
24	4	16	8
32	2	32	

Note:

1. *Other SIMM combinations can result in the same total memory.*
2. *When using a single SIMM, place it in S1 or S3 only.*
3. *Two-SIMM combinations can be used in either S1/S2 or S3/S4.*

Table 2-1. SIMM Configuratons[1] (continued)

Total (Mbytes)	Number of SIMMs	SIMMs 1 & 2 (Mbytes)	SIMMs 3 & 4 (Mbytes)
40	4	32	8
48	4	32	16
64	2	64	
72	4	64	8
80	4	64	16
96	4	64	32
128	4	64	64

Note:

1. *Other SIMM combinations can result in the same total memory.*
2. *When using a single SIMM, place it in S1 or S3 only.*
3. *Two-SIMM combinations can be used in either S1/S2 or S3/S4.*

2.4.2 AMD 29F002T 2-Mbit Flash Memory

The AMD 29F002T 2-Mbit flash memory component is organized as 256K by 8 bits. The flash device is divided into seven sectors (see Table 2-2) and features hardware sector protection, which disables both program and erase operations in any combination of the seven sectors of memory. The PLCC geometry/footprint is supported allowing a socket to be placed for laboratory use. The AMD 29F002T flash memory component is labeled U25 on the AMD Smoky Mountain motherboard (see Figure 3-1 on page 36).

Table 2-2. AMD 29F002T Flash Memory Organization

System Address	FLASH Memory Area
FC000h – FFFFFh	16-Kbyte Block
FA000h – FBFFFh	8-Kbyte Block
F8000h – F9FFFh	8-Kbyte Block
F0000h – F7FFFh	32-Kbyte Block
E0000h – EFFFFh	64-Kbyte Block
D0000h – DFFFFh	64-Kbyte Block
C0000h – CFFFFh	64-Kbyte Block

2.4.3 L2 Cache

The AMD Smoky Mountain motherboard provides 512 Kbytes or 1 Mbyte of second-level, look-aside, direct-mapped cache utilizing four 32K by 32-bit or four 64K by 32-bit, 15-ns PBSRAMs and one 32K by 8-bit, 7-ns tag SRAM. The four cache memory chips are labeled U13, U21, U30, and U37 (see Figure 3-1 on page 36). A 256-Kbyte cache can be implemented by populating the U21 and U30 PBSRAMS only. The motherboard can also operate without a level 2 (L2) cache.

2.5 Graphics Subsystem

The AMD Smoky Mountain motherboard provides integrated video utilizing the PCI S3 ViRGE, PCI S3 Trio64V+, or PCI S3 Trio64V chipset. Video memory consists of either 2 Mbytes or 4 Mbytes of 50-ns, EDO DRAM. The S3 ViRGE solution is a PCI bus master and requires the removal of one PCI slot to remain PCI 2.1-compliant. The slot removed is the ISA/PCI shared slot. The video resolutions and color depths supported are shown in Table 2-3. The video memory chips occupy positions U27, U28, U32, U33, U34, U35, U39, and U40 on the motherboard (see Figure 3-1 on page 36).

Table 2-3. Video Resolutions and Color Depths

Resolution	2 Mbyte Color Depth	4 Mbyte Color Depth
640 x 480	16, 256, 64K, 16.7M	16, 256, 64K, 16.7M
800 x 600	16, 256, 64K, 16.7M	16, 256, 64K, 16.7M
1024 x 768	16, 256, 64K	16, 256, 64K, 16.7M[1]
1152 x 864	256	256
1280 x 1024	16, 256	16, 256, 64K[1]
1600 x 1200	16, 256[1]	16, 256[1]

Note:
1. Interlaced

2.5.1 S3 ViRGE Video Chipset Features

The S3 ViRGE video chipset supports the following features:

- High-performance 64-bit 2D/3D graphics engine
- Integrated 135-MHz RAMDAC and clock synthesizer
- On-the-fly stretching and blending of primary RGB stream and RGB or YUV (video) secondary stream
- Different color depths in each stream
- Color space-converted YUV data
- High-quality, hardware-assisted video playback with horizontal interpolation
- Indeo, Cinepak, and software-accelerated MPEG-1 video
- High-performance 2D Windows acceleration
- Flat and Gourand shading for 3D
- High-quality, high-performance 3D texture mapping
- Perspective correction
- Bi-linear and tri-linear texture filtering
- MIP-mapping
- Depth cueing and fogging
- Alpha blending
- Video texture mapping
- Z-buffering
- Vertical interpolation for video playback
- 1280 x 1024 x 256 colors at 75-Hz refresh
- 1024 x 768 x 64K colors at 75-Hz refresh
- 800 x 600 x 16.7M colors at 75-Hz refresh
- PCI bus mastering for display list processing and video capture support
- EDO DRAMS (50 ns)
- Drivers for Windows 3.11, Windows NT, Windows 95, OS/2 2.1 and 3.0, ADI 4.2
- Full hardware and BIOS provision for VESA display power management signaling (DPMS) monitor power-saving modes
- DDC monitor communications support

2.5.2 S3 Trio64V+ Chipset Features

The S3 Trio64V+ video chipset supports the following features:

- High-performance DRAM-based 64-bit graphics engine
- Integrated 24-bit RAMDAC with 135-MHz output pixel rate and programmable dual-clock synthesizer
- On-the-fly stretching and blending of primary RGB stream and RGB or YUV (video) secondary stream
- Different color depths in each stream
- Color space-converted YUV data
- High-quality hardware-assisted video playback (up to 1024 x 768 x 16 bits/pixel)
- Indeo, Cinepak, and software-accelerated MPEG-1 video playback
- Hardware double-buffering for high-quality tear-free playback
- Scrolling and sprite plane
- Color and chroma keying for overlaying of graphics onto video and video onto graphics
- Arithmetic blending of two pixel streams for fade-in/fade-out transition effects
- 1280 x 1024 x 256 colors at 75-Hz refresh
- 1024 x 768 x 64K colors at 75-Hz refresh
- 800 x 600 x 16.7M colors at 75-Hz refresh
- EDO DRAMS (50 ns)
- Windows 3.11, Windows NT, Windows 95, OS/2 versions 2.1 and 3.0, and SCO UNIX
- Full hardware and BIOS provision for VESA display power management signaling (DPMS) monitor power-saving modes
- DDC monitor communications support

2.6 Audio Subsystem

The AMD Smoky Mountain motherboard includes a stereo audio subsystem that is compatible with the MPU-401 and the SoundBlaster audio solutions. The audio subsystem uses the Crystal 4238 audio chip. (The Crystal 4236 and Crystal 4237 can be used in place of the Crystal 4238.)

The audio subsystem supports a connection for an internal speaker (connector J20) and provides connections for stereo audio input, monaural microphone, and stereo headphones or speakers on the bottom half of the stacked connector J2 (see Figure 3-1 on page 36). Connector J1 provides audio input from a CD-ROM. FM synthesis resides on-board, and audio synthesis (wave table) can be added through an optional daughtercard attachment via connector J17. Connecting a device to the headphone/speaker jack turns off the internal speaker.

Connector J23 provides for external up, down, and mute volume control that can be mounted on the cabinet front bezel (see Figure 2-6, Figure 3-1 on page 36, and Figure 3-2 on page 38).

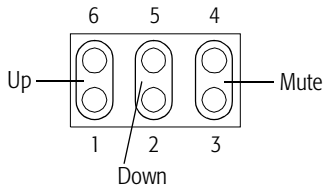


Figure 2-6. Front-Panel Audio Connector J27

2.7 Disk Subsystem

The AMD Smoky Mountain motherboard provides two bus-mastering, PCI IDE controllers. Each controller supports up to two enhanced IDE (EIDE) devices—mode 0, 1, 2, 3, or 4 IDE disk drives and IDE CD-ROM drives. The primary IDE controller is connector J22, and the secondary IDE controller is connector J27 (see Figure 3-1 on page 36). The pinouts of the two IDE connectors are described in Table 2-4.

Table 2-4. IDE/EIDE Connector Pinouts

Pin	Signal Name	Pin	Signal Name
1	Reset IDE	21	DDRQ0 (DDRQ1)
2	Ground	22	Ground
3	Host Data 7	23	$\overline{\text{I/O Write}}$
4	Host Data 8	24	Ground
5	Host Data 6	25	$\overline{\text{I/O Read}}$
6	Host Data 9	26	Ground
7	Host Data 5	27	IOCHRDY
8	Host Data 10	28	CSEL
9	Host Data 4	29	$\overline{\text{DDACK0}}$ ($\overline{\text{DDACK1}}$)
10	Host Data 11	30	Ground
11	Host Data 3	31	IRQ14 (IRQ15)
12	Host Data 12	32	Reserved
13	Host Data 2	33	Addr 1
14	Host Data 13	34	Reserved
15	Host Data 1	35	Addr 0
16	Host Data 14	36	Addr 2
17	Host Data 0	37	$\overline{\text{Chip Select 1P}}$ ($\overline{\text{Chip Select 1S}}$)
18	Host Data 15	38	$\overline{\text{Chip Select 3P}}$ ($\overline{\text{Chip Select 3S}}$)
19	Ground	39	$\overline{\text{Activity}}$
20	Key	40	Ground

The AMD Smoky Mountain motherboard also supports up to two 2.88-Mbyte flexible disk drives on a single cable inserted in connector J18 (see Figure 3-1 on page 36). The pinouts for the flexible disk drive connector are described in Table 2-5.

Table 2-5. Flexible Disk Drive Connector Pinouts

Pin	Signal Name	Pin	Signal Name
1	Ground	18	$\overline{\text{DIR}}$
2	DENSEL	19	Ground
3	Ground	20	$\overline{\text{STEP}}$
4	N/C	21	Ground
5	Key	22	$\overline{\text{Write Data}}$
6	FDEDIN	23	Ground
7	Ground	24	$\overline{\text{Write Gate}}$
8	$\overline{\text{Index}}$	25	Ground
9	Ground	26	$\overline{\text{Track 00}}$
10	$\overline{\text{Motor Enable A}}$	27	MSEN0
11	Ground	28	$\overline{\text{Write Protect}}$
12	$\overline{\text{Drive Select B}}$	29	Ground
13	Ground	30	$\overline{\text{Read Data}}$
14	$\overline{\text{Drive Select A}}$	31	Ground
15	Ground	32	$\overline{\text{Side 1 Select}}$
16	$\overline{\text{Motor Enable B}}$	33	Ground
17	MSEN1	34	$\overline{\text{Diskette Change}}$

2.8 Expansion Slots

The AMD Smoky Mountain motherboard provides four 32-bit PCI and three 16-bit ISA expansion slots. The PCI slots are labeled J10, J11, J12, and J13. The ISA slots are labeled J6, J7, and J8. (See Figure 3-1 on page 36.)

PCI J10 and ISA J8 share a common slot, except when the S3 ViRGE video chipset is used. In this case, PCI slot J10 is removed from the board, and J6, J7, and J8 are ISA-only slots.

All PCI expansion slots are full-length and have the following characteristics:

- Conform to PCI Specification Revision 2.1 or higher
- 3.3-V signaling PCI adapters are not supported
- 3.3 V is not supplied to the PCI connectors

Table 2-6 and Table 2-7 describe the PCI- and ISA-slot pinouts.

Table 2-6. PCI Connector Pinouts

Pin	Signal Name	Pin	Signal Name
A1	V_{CC}	B1	-12 V
A2	+12 V	B2	TCK
A3	TMS	B3	Ground
A4	TD1	B4	TD0
A5	V_{CC}	B5	V_{CC}
A6	$\overline{\text{INTA}}$	B6	V_{CC}
A7	$\overline{\text{INTC}}$	B7	$\overline{\text{INTB}}$
A8	V_{CC}	B8	$\overline{\text{INTD}}$
A9	Reserved	B9	$\overline{\text{Prsnt1}}$
A10	V_{CC}	B10	Reserved
A11	Reserved	B11	$\overline{\text{Prsnt2}}$
A12	Ground	B12	Ground
A13	Ground	B13	Ground
A14	Reserved	B14	PAR
A15	$\overline{\text{SPCIRST}}$	B15	Ground
A16	V_{CC}	B16	PCLKE

Table 2-6. PCI Connector Pinouts (continued)

Pin	Signal Name	Pin	Signal Name
A17	$\overline{\text{AGNT}}$	B17	Ground
A18	Ground	B18	$\overline{\text{REQA}}$
A19	Reserved	B19	V_{CC}
A20	AD30	B20	AD31
A21	3.3 V	B21	AD29
A22	AD28	B22	Ground
A23	AD26	B23	AD27
A24	Ground	B24	AD25
A25	AD24	B25	3.3 V
A26	IDSEL	B26	$\overline{\text{CBE3}}$
A27	3.3 V	B27	AD23
A28	AD22	B28	Ground
A29	AD20	B29	AD21
A30	Ground	B30	AD19
A31	AD18	B31	3.3 V
A32	AD16	B32	AD17
A33	3.3 V	B33	$\overline{\text{CBE2}}$
A34	$\overline{\text{FRAME}}$	B34	Ground
A35	Ground	B35	$\overline{\text{IRDY}}$
A36	$\overline{\text{TRDY}}$	B36	3.3 V
A37	Ground	B37	$\overline{\text{DEVSEL}}$
A38	$\overline{\text{STOP}}$	B38	Ground
A39	3.3 V	B39	$\overline{\text{PLOCK}}$
A40	SDONE	B40	$\overline{\text{PERR}}$
A41	$\overline{\text{SBO}}$	B41	3.3V
A42	Ground	B42	$\overline{\text{SERR}}$
A43	PAR	B43	3.3 V
A44	AD15	B44	$\overline{\text{CBE1}}$
A45	3.3 V	B45	AD14
A46	AD13	B46	Ground
A47	AD11	B47	AD12
A48	Ground	B48	AD10
A49	AD9	B49	Ground
A50	KEY	B50	KEY

Table 2-6. PCI Connector Pinouts (continued)

Pin	Signal Name	Pin	Signal Name
A51	KEY	B51	KEY
A52	$\overline{CBE0}$	B52	AD8
A53	3.3 V	B53	AD7
A54	AD6	B54	3.3 V
A55	AD4	B55	AD5
A56	Ground	B56	AD3
A57	AD2	B57	Ground
A58	AD0	B58	AD1
A59	V_{CC}	B59	V_{CC}
A60	$\overline{SREQ64}$	B60	$\overline{SACK64}$
A61	V_{CC}	B61	V_{CC}
A62	V_{CC}	B62	V_{CC}

Table 2-7. ISA Connector Pinouts

Pin	Signal Name	Pin	Signal Name
B1	Ground	A1	$\overline{\text{IOCHK}}$
B2	RSTDRV	A2	SD7
B3	Vcc	A3	SD6
B4	IRQ9	A4	SD5
B5	-5 V	A5	SD4
B6	DRQ2	A6	SD3
B7	-12 V	A7	SD2
B8	$\overline{\text{OWS}}$	A8	SD1
B9	+12 V	A9	SD0
B10	Ground	A10	IOCHRDY
B11	$\overline{\text{SMEMW}}$	A11	AEN
B12	$\overline{\text{SMSMR}}$	A12	SA19
B13	$\overline{\text{IOW}}$	A13	SA18
B14	$\overline{\text{IOR}}$	A14	SA17
B15	$\overline{\text{DACK3}}$	A15	SA16
B16	DRQ3	A16	SA15
B17	$\overline{\text{DACK1}}$	A17	SA14
B18	DRQ1	A18	SA13
B19	$\overline{\text{REFRESH}}$	A19	SA12
B20	SYSCLK	A20	SA11
B21	IRQ7	A21	SA10
B22	IRQ6	A22	SA9
B23	IRQ5	A23	SA8
B24	IRQ4	A24	SA7
B25	IRQ3	A25	SA6
B26	$\overline{\text{DACK2}}$	A26	SA5
B27	TC	A27	SA4
B28	BALE	A28	SA3
B29	V_{CC}	A29	SA2
B30	OSC	A30	SA1
B31	Ground	A31	SA0
KEY		KEY	
D1	$\overline{\text{MEMCS16}}$	C1	$\overline{\text{SBHE}}$

Table 2-7. ISA Connector Pinouts (continued)

Pin	Signal Name	Pin	Signal Name
D2	$\overline{\text{IOCS16}}$	C2	LA23
D3	IRQ10	C3	LA22
D4	IRQ11	C4	LA21
D5	IRQ12	C5	LA20
D6	IRQ15	C6	LA19
D7	IRQ14	C7	LA18
D8	$\overline{\text{DACK0}}$	C8	LA17
D9	DRQ0	C9	$\overline{\text{MEMR}}$
D10	$\overline{\text{DACK5}}$	C10	$\overline{\text{MEMW}}$
D11	DRQ5	C11	SD8
D12	$\overline{\text{DACK6}}$	C12	SD9
D13	DRQ6	C13	SD10
D14	$\overline{\text{DACK7}}$	C14	SD11
D15	DRQ7	C15	SD12
D16	V_{CC}	C16	SD13
D17	$\overline{\text{Master}}$	C17	SD14
D18	Ground	C18	SD15

3

Switch Settings and Connector Descriptions

The AMD Smoky Mountain motherboard has three dip switches (SW1, SW2, and SW3) to configure the board. SW1 is the processor core voltage and bus frequency selection switch, SW2 is the dual-voltage selection switch, and SW3 is the clock multiplier selection switch (see Figure 3-1 on page 36).

3.1 Core Voltage and Bus Frequency Selection

SW1 selects the core voltage and bus frequency for the processor. Table 3-1 and Table 3-2 list the core voltage switch settings for dual-voltage and single-voltage processors respectively. Table 3-3 lists the bus frequency settings for all processors.

Table 3-1. AMD-K6 Processor Core Voltage Settings (SW1)

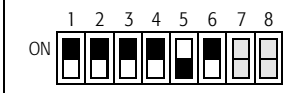
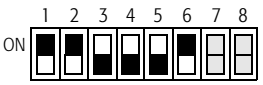
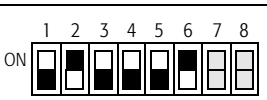
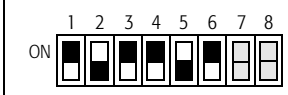
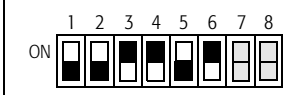
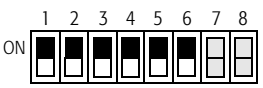
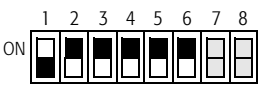
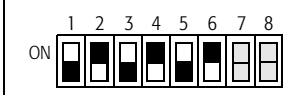
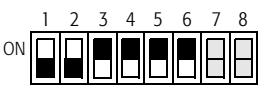
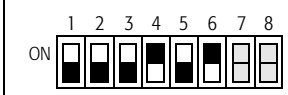
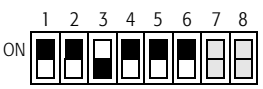
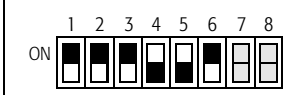
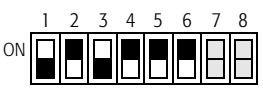
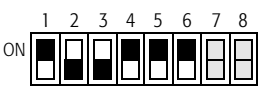
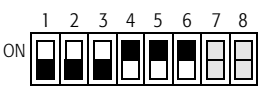
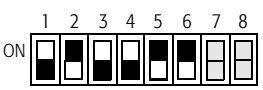
Core Voltage	Switch Setting	Core Voltage	Switch Setting
3.4 V		2.2 V	
3.3 V		2.1 V	
3.2 V		2.0 V	
3.1 V		1.8 V	
3.0 V		1.7 V	
2.9 V		1.6 V	
2.8 V		1.5 V	
2.7 V		1.4 V	
2.6 V		1.3 V	
2.5 V		1.2 V	
2.4 V		1.1 V	
2.3 V		1.1 V	

Table 3-2. AMD-K5 & P54C Processors Core Voltage Setting (SW1)

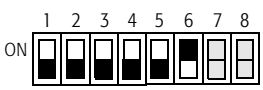
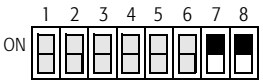
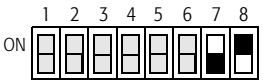
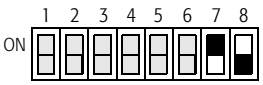
Processor	Switch Settings
AMD-K5 All Models	
All P54C	

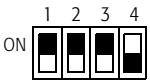
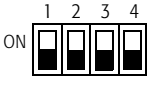
Table 3-3. Bus Frequency Switch Settings (SW1)

CPU Bus	PCI Bus	Switch Settings
50 MHz	25 MHz	
60 MHz	30 MHz	
66 MHz	33 MHz	

3.2 Processor Dual Voltage Selection

The processor dual voltage selection switch (SW2) effectively shorts the two voltage planes together for single-voltage processors and configures two separate voltage planes for dual-voltage processors. The switch settings are show in Table 3-4.

Table 3-4. SW2 Switch Settings

Processor	Switch Settings
AMD-K5 & P54C	
AMD-K6 & Dual-Voltage Processors	

3.3 Clock Multiplier Selection

SW3 selects the clock multiplier for all processors. Table 3-5 lists the switch settings for the AMD-K6 processor. Table 3-6 lists the switch setting for the AMD-K5 and other socket-7 compatible processors.

Table 3-5. AMD-K6 Processor Clock Multiplier Switch Settings (SW3)

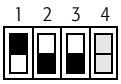
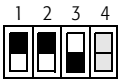
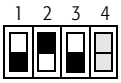
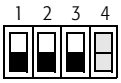
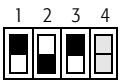
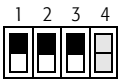
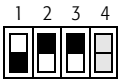
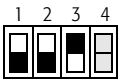
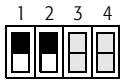
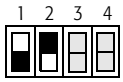
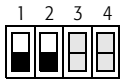
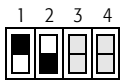
Multiplier	Switch Settings
2.0	
2.5	
3.0	
3.5	
4.0	
4.5	
5.0	
5.5	

Table 3-6. AMD-K5 & P54C Processors Clock Multiplier Settings (SW3)

Multiplier	Switch Settings
1.5	
2.0	
2.5	
3.0	

3.4 AMD Smoky Mountain Motherboard Components

The locations of the AMD Smoky Mountain motherboard major components and connectors are shown in Figure 3-1.

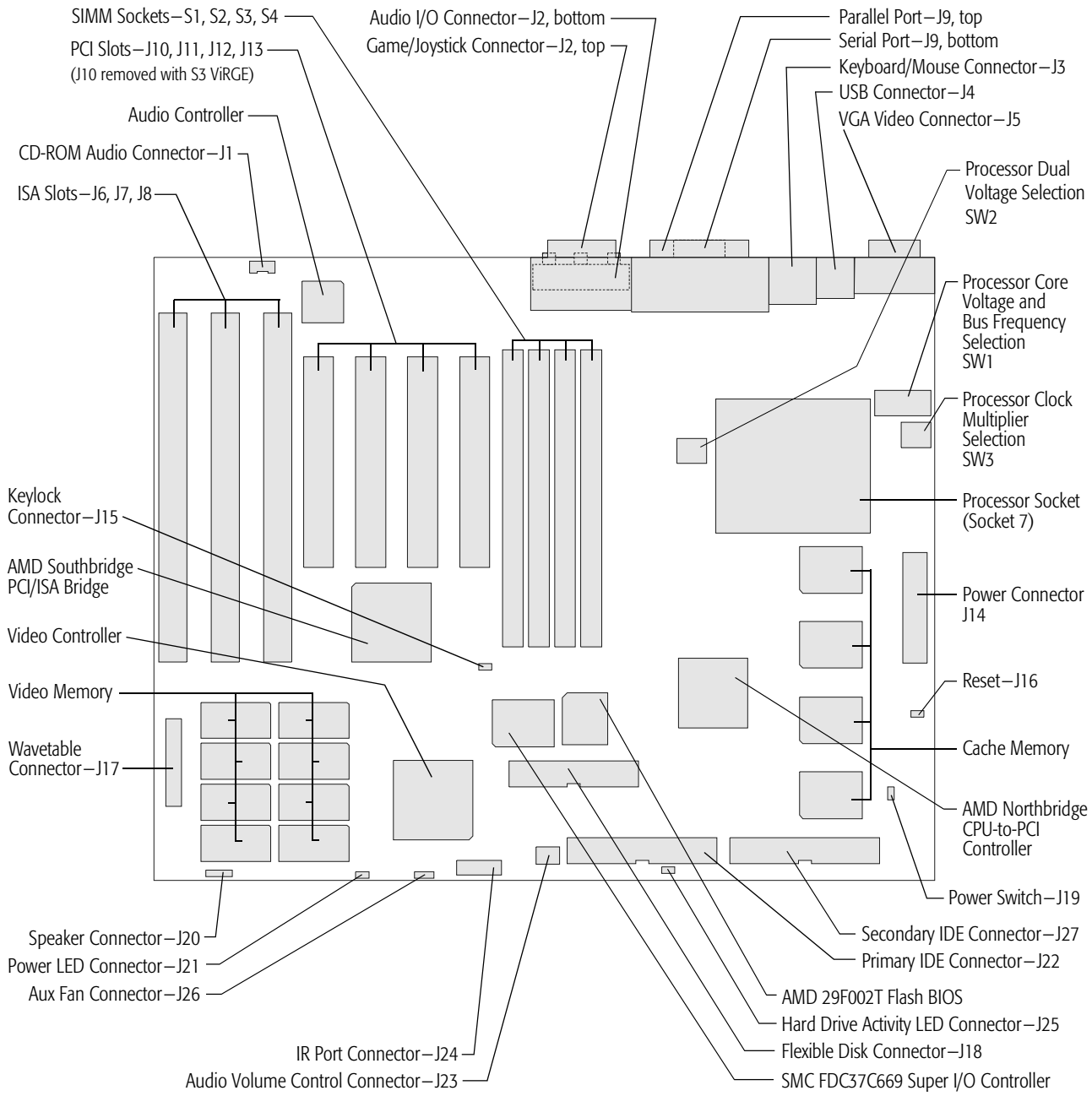


Figure 3-1. AMD Smoky Mountain Motherboard Component Locations

3.4.1 AMD Smoky Mountain Motherboard Connector Detail

Table 3-7 lists the motherboard connectors and Figure 3-2 shows their orientation.

Table 3-7. AMD Smoky Mountain Motherboard Connectors

Number	Name	Comments
J1	CD ROM	Connector for CD-ROM audio cable
J2	Unnamed on board (part of rear I/O header)	Stacked rear-panel connector Top half = game/joystick connector Bottom half = audio, microphone, speaker/ headphone connector
J3		Stacked rear-panel connector Keyboard/mouse connector
J4		Stacked rear-panel connector Two USB connectors
J5		Rear-panel connector VGA connector
J9		Stacked rear-panel connector Top half = parallel port Bottom half = serial port
J14	—	Motherboard main power connector
J15	KEYLOCK	Connector for keylock switch Open = unlocked Closed = locked
J16	RESET	Connector for reset switch Momentary close = reset
J17	WAVETABLE	Connector for audio wavetable cable
J18	FLEX DISK	Connector for the floppy disk drives
J19	PWR SWITCH	Connector for power on/off switch Momentary close = toggle
J20	SPKR	Connector for internal speaker
J21	POWER LED	Connector for power LED
J22	PRIMARY IDE CONTROLLER	Connector for the primary IDE controller
J23	UP DOWN MUTE	Connector for front-panel audio volume controls (momentary closure)
J24	IR	Connector for infrared
J25	HD ACT	Connector for hard drive activity LED
J26	AUX FAN	Power connector for auxilliary fan
J27	SECONDARY IDE CONTROLLER	Connector for the secondary IDE controller

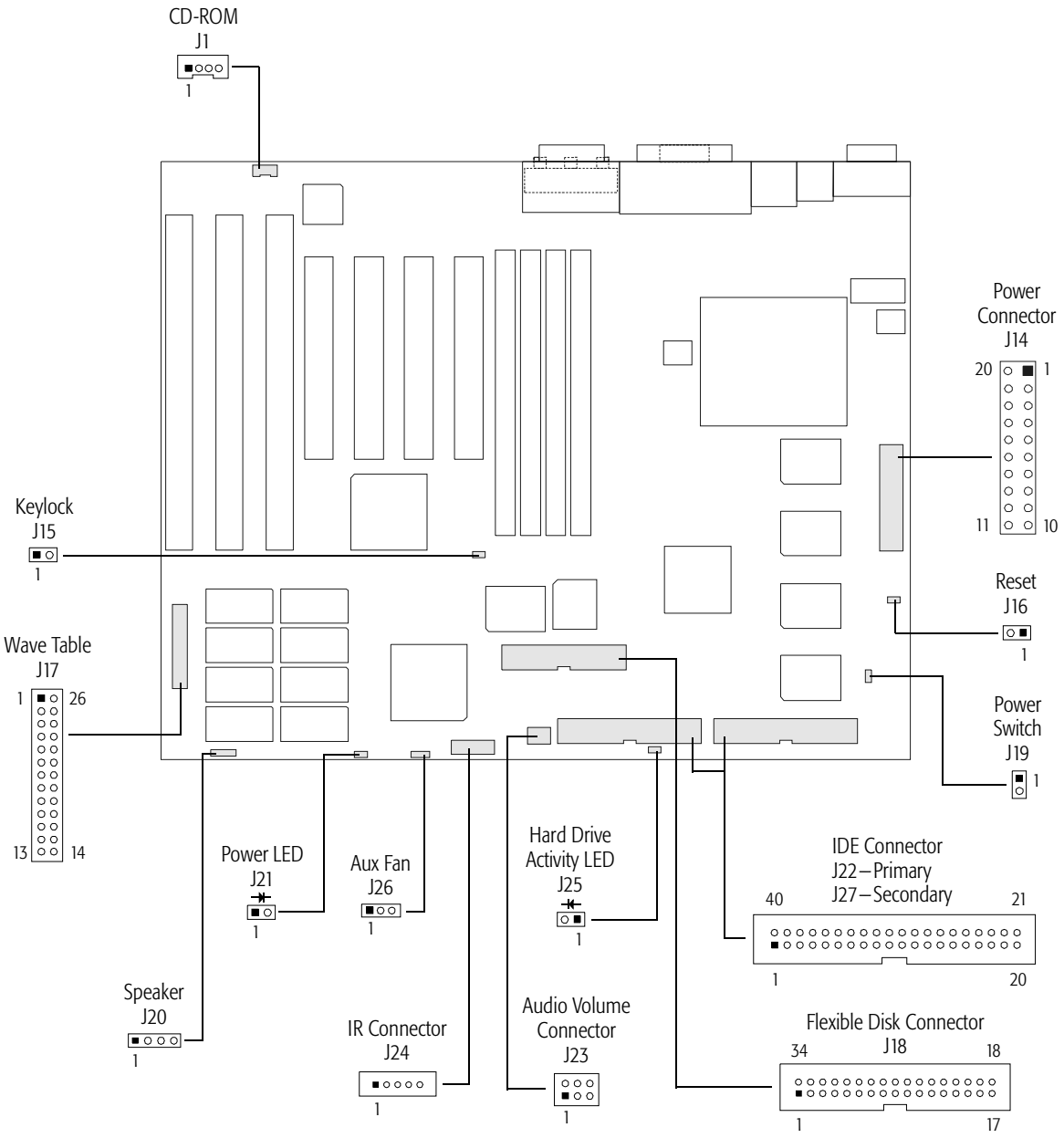


Figure 3-2. AMD Smoky Mountain Motherboard Connector Details

3.4.2 Rear-Panel I/O Connectors

Figure 3-3 shows the locations of the AMD Smoky Mountain motherboard rear-panel I/O connectors.

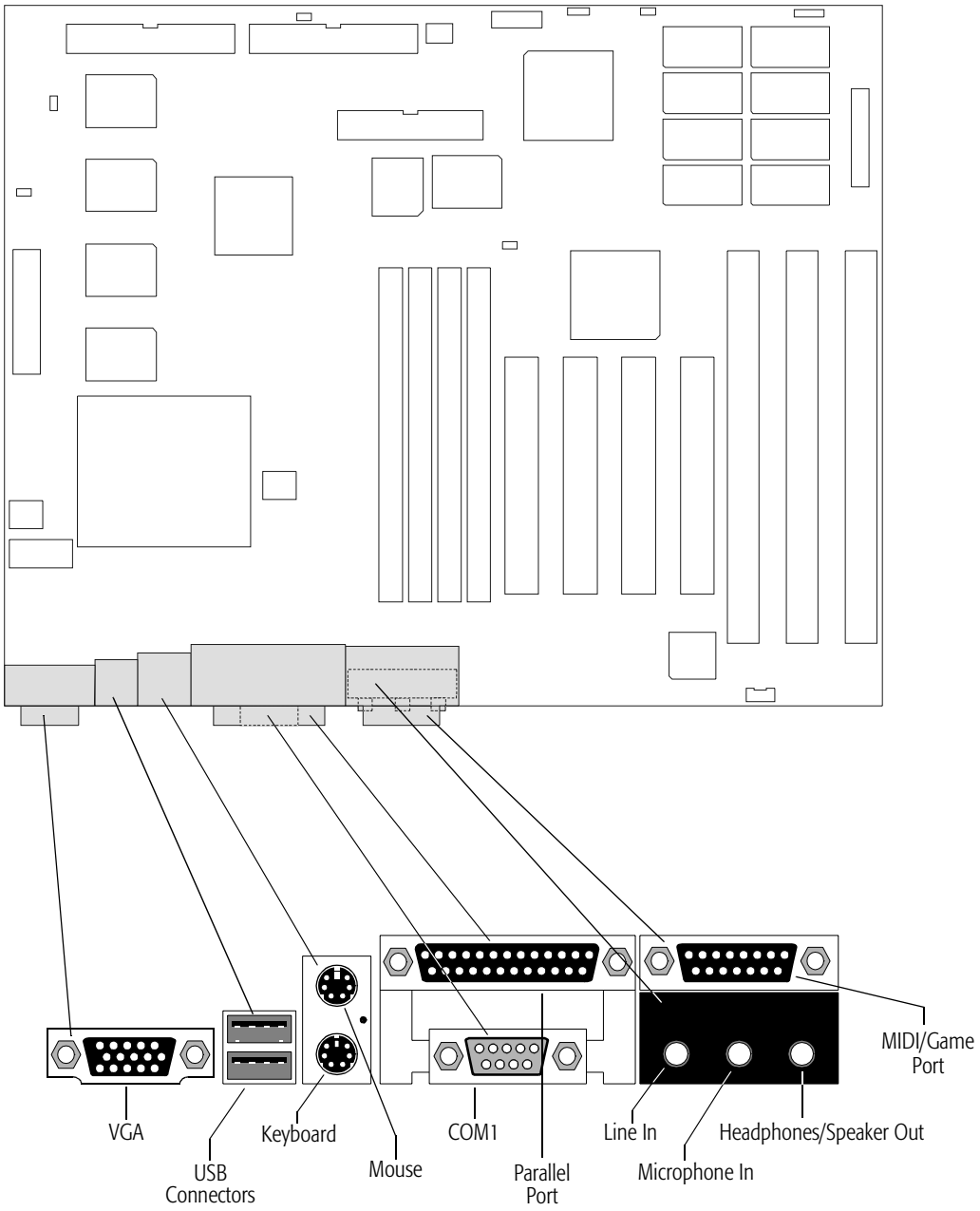


Figure 3-3. AMD Smoky Mountain Motherboard Rear-Panel I/O Connectors

4

System Software

The motherboard uses the Award *Elite*BIOS by Award Software, Inc. The BIOS is stored in the AMD 29F002T flash EEPROM and can be upgraded from diskette (see Section 4.7 on page 77). The flash EEPROM also contains the following:

- Windows 95-ready Award Plug-N-Play BIOS Extension
- CMOS setup utility
- Power-on self tests (POST)
- Advanced power management (APM) 1.1
- PCI auto-configuration utility

4.1 Plug and Play

When used in conjunction with the ISA configuration utility (ICU), the Award BIOS with Plug-N-Play BIOS Extension v1.0A supports ISA Plug-N-Play capabilities. The BIOS auto-configures Plug-N-Play ISA cards and PCI cards and allows resource management for legacy ISA cards. Computer configuration information is stored in ESCD format.

To support Windows 95 run-time Plug-N-Play utilities, the BIOS only assigns resources to devices that are critical to booting. To ensure Windows-95 compatibility, device node information is available for all devices.

4.2 PCI Auto-Configuration

To allow the insertion and removal of PCI cards without user intervention, the PCI auto-configuration utility (in conjunction with the CMOS setup utility) automatically configures I/O space, interrupts, and other parameters for any new PCI card present on power-up. The CMOS setup utility must be used to designate which interrupts are used by any legacy (i.e., non-PNP) ISA cards. Any IRQs not set to "Legacy ISA" in the CMOS setup are considered "free" and can be distributed to PCI cards by the PCI auto-configuration utility. The way in which PCI interrupts are assigned to ISA IRQs is completely nondeterministic. The PCI auto-configuration function complies with version 2.10 of the PCI BIOS specification.

4.3 Advanced Power Management

The BIOS supports advanced power management (APM version 1.2). When in stand-by mode, the AMD Smoky Mountain motherboard utilizes the system management mode (SMM) capabilities of the AMD-K5 and AMD-K6 processors to reduce power consumption. Hard drives can be spun down and VESA DPMS-compliant monitors can be turned off. The user selects which mode to use (doze or suspend) during CMOS setup. The user configures the motherboard to respond to external interrupts while in the power-saving modes by enabling or disabling each interrupt in the CMOS setup. APM is disabled in BIOS by default. Upon detecting the presence of the APM BIOS, Windows 95 enables APM automatically.

4.4 Award BIOS CMOS Setup Utility

The Award BIOS CMOS setup utility allows the CMOS configuration to be modified. After system configuration modifications are complete, the setup utility stores the changed parameters in CMOS and reboots the system.

Note: *To clear the CMOS memory, do one of the following:*

1. *Remove the battery, wait a few seconds, and replace the battery. This effectively restores the BIOS default values.*
2. *Load the BIOS defaults using the setup utility.*

4.4.1 Starting the Setup Utility

The setup utility is accessed in one of two ways:

- By pressing the <Del> key immediately after switching the system on
- By either pressing the <Del> key or simultaneously pressing the <Ctrl><Alt><Esc> key combination when the following message is briefly displayed at the bottom of the screen during POST:

```
TO ENTER SETUP BEFORE BOOT PRESS CTRL-ALT-ESC OR DEL KEY
```

If the correct keys are not pressed before the message is erased, the setup program can still be entered by simply restarting the system. If the keys are not pressed at the correct time and the system does not boot, the following error message is displayed:

```
PRESS F1 TO CONTINUE, CTRL-ALT-ESC OR DEL TO ENTER SETUP
```

Setup Keys

Table 4-1 shows the keys available to navigate through the setup program.

Table 4-1. Setup Utility Navigation Keys

Key	Action
Up Arrow	Move to the previous item
Down Arrow	Move to the next item
Left Arrow	Move to the item in the left-hand column
Right Arrow	Move to the item in the right-hand column

Table 4-1. Setup Utility Navigation Keys (continued)

Key	Action
Esc	Main Menu: Quit and do not save changes to CMOS Status Page Setup Menu and Option Page Setup Menu: Exit current page and return to the Main Menu
PgUp	Increase the numeric value or make changes
PgDn	Decrease the numeric value or make changes
+ key	Increase the numeric value or make changes
– key	Decrease the numeric value or make changes
F1	General Help (only for Status Page Setup Menu and Option Page Setup Menu)
F2 Shift-F2	Select screen colors from the available 16 colors F1: Select next color Shift-F1: Select previous color
F3	Calendar (only for Status Page Setup Menu)
F5	Restore the previous CMOS value from CMOS (only for Option Page Setup Menu)
F6	Load the default CMOS value from the BIOS default table (only for Option Page Setup Menu)
F7	Load the default
F10	Save all the CMOS changes (only for Main Menu)

In Case of Problems

If the modifications to the configuration parameters do not allow the system to boot, the Award BIOS supports an override function that resets the CMOS to its default settings.

Invoke the override function by immediately pressing the <Insert> key after powering-up the system.

4.4.2 Setup Utility Variations

Not all systems have the same setup. Each system design and chipset combination require custom configurations. The basic look and functions of the setup program remain the same, but the appearance of the setup screens may differ depending on what parts of the setup program are made available by the system designer. The screen figures used in the following sections are generic.

4.4.3 Main Setup Menu

The main setup menu is shown in Figure 4-1. The main menu allows selection from several setup functions and two exit choices. The arrow keys are used to select menu items. A brief description of each highlighted selection is displayed at the bottom of the screen. Press the <Enter> key to accept the highlighted choice and enter that sub-menu.

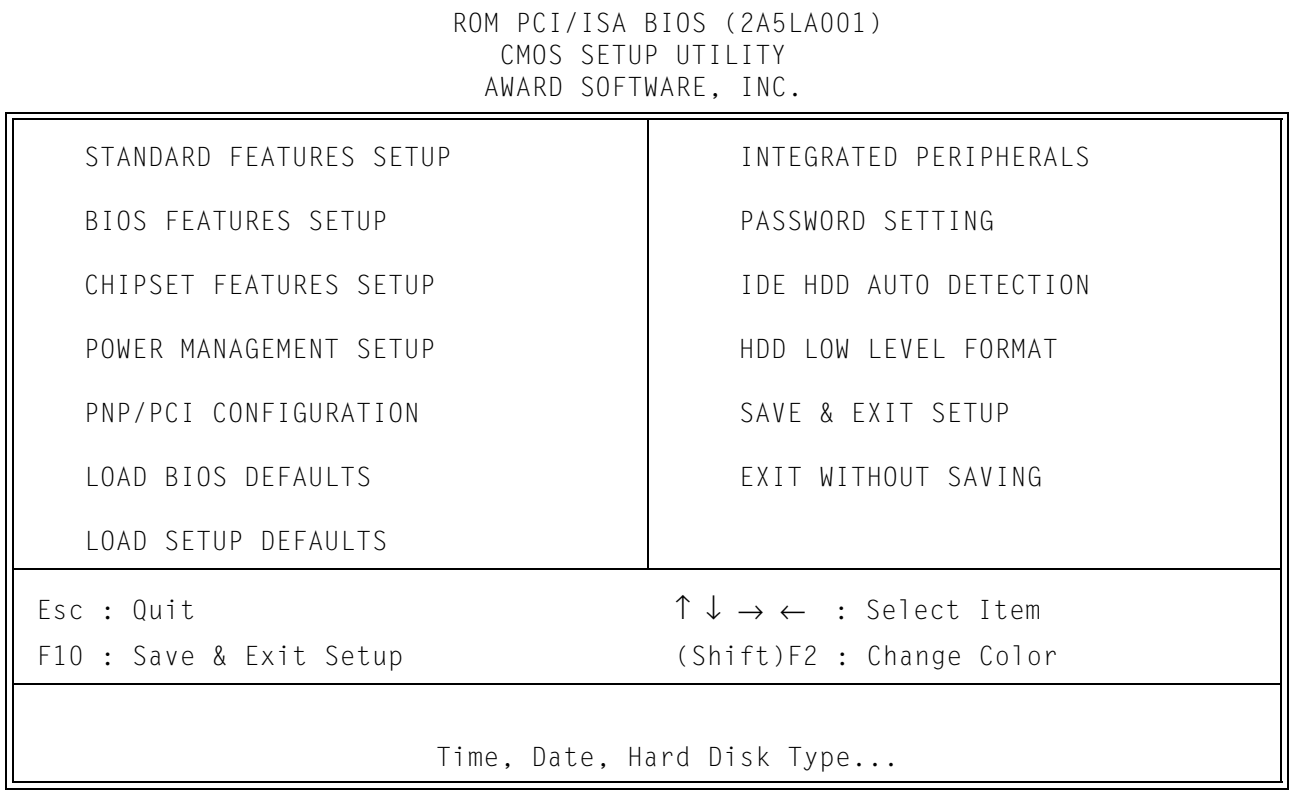


Figure 4-1. CMOS Setup Utility Main Menu

Standard Features Setup This selection allows configuration of the original PC AT-compatible BIOS options.

BIOS Features Setup The Award enhanced BIOS options are configured with this menu selection.

Chipset Features Setup This selection allows configuration of options specific to the chipset used on the motherboard.

Power Management Setup Configure the APM options by selecting this option.

PnP/PCI Configuration The standard Plug and Play and PCI local bus options are configured by selection this option.

Load BIOS Defaults Choosing this selection loads the BIOS defaults. BIOS defaults are factory settings for the most stable, minimal-performance system operations.

Load Setup Defaults Choosing this selection loads the setup defaults. Setup defaults are factor settings for optimal-performance system operations.

Integrated Peripherals I/O subsystems that depend on the integrated peripherals controller are configured with this selection.

Password Setting This option changes, sets, or disables a password. The password function limits access to the setup utility to only those persons who know the password.

IDE HDD Auto Detection This function automatically detects IDE hard disk drives and configures their parameters.

HDD Low Level Format This option allows low-level formatting of hard drives.

Note: *Award provides this function for service personnel only. Most manufacturers of IDE hard drives strongly recommend against low-level formatting of their drives, because of the danger that the bad-track table may be over-written.*

Contact the drive manufacturer for instructions before low-level formatting an IDE hard drive.

Save and Exit Setup This selection saves the settings in CMOS RAM and exits the setup program.

Exit Without Saving Choosing this selection abandons all changes and exits the setup program.

4.4.4 Standard Features Setup

Using the standard features setup screen, the following functions are performed:

- The system clock and calendar are set
- Hard disk drive parameters are recorded
- The video subsystem type is selected
- The type of errors that stop the BIOS POST are selected

Figure 4-2 shows the standard features setup menu screen.

```
                    ROM PCI/ISA BIOS (2A5LA001)
                      STANDARD FEATURES SETUP
                      AWARD SOFTWARE, INC.

    Date (mm:dd:yy) : Tue, Feb 23 1997
    Time (hh:mm:ss) :  9 : 35 :  7

    HARD DISKS         TYPE   SIZE    CYLS HEAD PRECOMP LANDZ SETCOR  MODE
    ------------------------------------------------------------------------
    Primary Master   : Auto      0       0    0       0     0       0  AUTO
    Primary Slave    : Auto      0       0    0       0     0       0  AUTO
    Secondary Master : Auto      0       0    0       0     0       0  AUTO
    Secondary Slave  : Auto      0       0    0       0     0       0  AUTO

    Drive A : 1.44M, 3.5 in.
    Drive B : None                              Base Memory:   640K
                                              Extended Memory: 31744K
    Video   : EGA/VGA                            Other Memory:   384K
    Halt On : All Errors                       ----------------------
                                                 Total Memory: 32768K

Esc : Quit              ↑ ↓ → ←  : Select Item       PU/PD/+/- : Modify
F1  : Help              (Shift)F2 : Change Color
```

Figure 4-2. Standard Features Setup Screen

Date

All parameters can be adjusted except the day of the week, which is determined automatically from the other date information. Adjust the date as follows:

1. Press the left or right arrow key to move to the field to be changed.
2. Press the <PgUp> or <PgDn> key to increment or decrement the value. The values can also be typed directly into the fields.

Time

The time format is based on the 24-hour military-time clock. For example, 1:00 p.m. is 13:00:00. Adjust the time by following the same procedure used to adjust the date.

Hard Disks

The BIOS supports up to four IDE drives. This section does not show information about other IDE devices, such as CD-ROM drives, nor does it contain information about other types of hard drives, such as SCSI drives.

The BIOS can automatically detect the specifications and optimal operating mode of almost all IDE hard drives. When type AUTO is selected, the BIOS detects the hard drive specifications during POST, every time the system boots.

Note: *Type AUTO is recommended for all drives.*

If drive type AUTO is not wanted, other methods of selecting the drive type are available:

- Match the specifications of the installed IDE hard drive(s) with the preprogrammed values for drive types 1 through 45
- Select USER and enter values into each drive parameter field
- Use the IDE HDD AUTO DECTECTION function in the setup program

Table 4-2 provides a brief description of each drive specification.

Table 4-2. Hard Drive Specification Descriptions

<table>
<tr><th>Specification</th><th>Description</th></tr>
<tr><td>Type</td><td>The BIOS contains a table of pre-defined drive types. Each defined drive type has a specified number of cylinders, number of heads, write pre-compensation factor, landing zone, and number of sectors. Drives with specifications that do not accommodate any pre-defined type are classified as type USER.</td></tr>
<tr><td>Size</td><td>Disk drive capacity (approximate). Note that this size is usually slightly greater than the size of a formatted disk given by a disk-checking program.</td></tr>
<tr><td>Cyls</td><td>Number of cylinders</td></tr>
<tr><td>Head</td><td>Number of heads</td></tr>
<tr><td>Precomp</td><td>Write precompensation cylinder</td></tr>
<tr><td>Landz</td><td>Landing zone</td></tr>
<tr><td>Sector</td><td>Number of sectors</td></tr>
<tr><td>Mode</td><td>Four modes are supported as described below:
<table>
<tr><th>Mode</th><th>Description</th></tr>
<tr><td>Auto</td><td>The BIOS automatically determines the optimal mode.</td></tr>
<tr><td>Normal</td><td>The maximum number of cylinders, heads, and sectors supported are 1024, 16, and 63 respectively.</td></tr>
<tr><td>Large</td><td>This mode is for drives that do not support LBA and have more than 1024 cylinders.</td></tr>
<tr><td>LBA</td><td>LBA stands for logical block addressing. During drive accesses, the IDE controller transforms the data address described by sector, head, and cylinder number into a physical block address, significantly improving data transfer rates. This mode is for drives with greater than 1024 cylinders.</td></tr>
</table></td></tr>
</table>

Drive A
Drive B

Select the correct specifications for the flexible disk drives installed in the computer. The supported flexible disk types are listed in Table 4-3.

Table 4-3. Flexible Disk Types

Type	Description
None	No flexible disk drive installed
360K, 5.25 in	5-¼-inch, PC-type standard drive—360-Kbyte capacity
1.2M, 5.25 in	5-¼-inch, AT-type high-density drive—1.2-Mbyte capacity
720K, 3.5 in	3-½-inch double-sided drive—720-Kbyte capacity
1.44M, 3.5 in	3-½-inch double-sided drive—1.44-Mbyte capacity
2.88M, 3.5 in	3-½-inch double-sided drive—2.88-Mbyte capacity

Video

Select the type of primary video subsystem installed in the computer. The BIOS usually detects the correct video type automatically. The BIOS supports a secondary video subsystem, but it cannot be selected in the setup program. Table 4-4 lists the primary video subsystems supported.

Table 4-4. Video Subsystems Supported

Type	Description
EGA/VGA	Enhanced Graphics Adapter/Video Graphics Array—for EGA, VGA, SEGA, SVGA, or PGA monitor adapters
CGA 40	Color Graphics Adapter—power up in 40-column mode
CGA 80	Color Graphics Adapter—power up in 80-column mode
MONO	Monochrome adapter—includes high-resolution monochrome adapters

Halt On

During POST, the system stops if the BIOS detects a hardware error. Select the types of errors that halt the system by choosing one of the selections for this parameter. Table 4-5 lists the available selections.

Table 4-5. Error Type Setup

Error Type	Description
No errors	POST does not stop for any errors
All errors	If the BIOS detects any non-fatal error, POST stops and prompts you to take corrective action

Table 4-5. Error Type Setup (continued)

Error Type	Description
All, But Keyboard	POST does not stop for a keyboard error, but stops for all other errors
All, But Diskette	POST does not stop for diskette drive errors, but stops for all other errors
All, But Disk/Key	POST does not stop for either diskette drive or keyboard errors, but stops for all other errors

Memory

The values in the memory fields cannot be changed. They are information-only fields. The fields show the total installed memory and the amounts allocated to base memory, extended memory, and other (high) memory.

4.4.5 BIOS Features Setup

The Award enhanced BIOS options are configured using the parameters on this screen. Figure 4-3 shows the available parameters. The values displayed are the default values for all parameters.

```
                    ROM PCI/ISA BIOS (2A5LA001)
                      BIOS FEATURES SETUP
                      AWARD SOFTWARE, INC.

Virus Warning                : Disabled   Video  BIOS Shadow  : Enabled
CPU Internal Cache           : Enabled    C8000-CBFFF Shadow  : Disabled
External Cache               : Enabled    CC000-CFFFF Shadow  : Disabled
Quick Power On Self Test     : Disabled   D0000-D3FFF Shadow  : Disabled
Boot Sequence                : A,C        D4000-D7FFF Shadow  : Disabled
Swap Floppy Drive            : Disabled   D8000-DBFFF Shadow  : Disabled
Boot Up Floppy Seek          : Enabled    DC000-DFFFF Shadow  : Disabled
Boot Up NumLock Status       : On
Boot Up System Speed         : High
IDE HDD Block Mode           : Enabled
Gate A20 Option              : Fast
Memory Parity/ECC Check      : Disabled
Typematic Rate Setting       : Disabled
Typematic Rate (Chars/Sec)   : 6          Esc : Quit        ↑↓→← : Select Item
Typematic Delay (Msec)       : 250        F1  : Help        PU/PD/+/- : Modify
Security Option              : Setup      F5  : Old Values  (Shift)F2 : Color
Write Allocate Support       : Enabled    F6  : Load BIOS  Defaults
PCI/VGA Palette Snoop        : Disabled   F7  : Load Setup Defaults
OS Select For DRAM > 64MB    : Non-OS2
```

Figure 4-3. BIOS Features Setup Screen

Virus Warning

When virus warning is *enabled*, a warning message is displayed if a program attempts to write to the boot sector on the partition table of the hard drive. This feature protects only the boot sector, not the entire hard drive.

Note: *Many disk diagnostic programs that access the boot sector trigger the virus warning message. If such a program is used, we recommend disabling the virus warning first.*

CPU Internal Cache

If the processor has internal cache memory, this feature should be *enabled*.

External Cache If the motherboard has cache installed, this feature should be *enabled*.

Quick Power On Self Test Select *enabled* to reduce the amount of time required to run the POST. Because a quick POST disables certain steps in the testing sequence, a setting of *disabled* is recommended.

Boot Sequence The sequence used to search for an operating system to boot is controlled by this parameter. The possible settings are as follows:

- A, C
- C, A
- C, CDROM, A
- CDROM, C, A

Swap Floppy Drive This field is effective only in systems with two floppy drives. Selecting *enabled* assigns physical drive B to logical drive A and physical drive A to logical drive B.

Boot Up Floppy Seek When enabled, the BIOS performs a seek on the floppy drives to determine whether they have 40 or 80 tracks. Because only 360-Kbyte floppy drives have 40 tracks, and very few present-day computers have 360-Kbyte floppy drives, we recommend that this parameter be disabled to save time booting up.

Boot Up Numlock Status Toggle this parameter between *on* and *off* to control the state of the NumLock key when the system boots. When toggled *on*, the numeric keypad generates numbers instead of cursor-control operations.

Boot Up System Speed Select *high* to boot at the default processor speed. Select *low* to boot at the speed of the AT bus.

IDE HDD Block Mode Block mode is also called block transfer, multiple commands, or multiple sector read/write. If the IDE hard drive supports block mode, select *enabled* for automatic detection of the optimal number of block read/write operations per sector that the drive can support.

Gate A20 Option Gate A20 refers to the way the system addresses memory above 1 Mbyte (extended memory). When set to *fast*, the system chipset controls gate A20. When set to *normal*, the keyboard controller controls gate A20. Setting gate A20 to Fast improves system speed, particularly with OS/2 and Windows operating systems.

Memory Parity Check Select *enabled* only if system memory (DRAM) contains parity. Selecting *enabled* adds a parity check to the POST memory tests. If the BIOS detects a parity error, a message is displayed describing the problem and the location (if possible) of the problem. The boot process then terminates.

Typematic Rate Setting When *disabled*, keystrokes repeat at a rate determines by the keyboard controller. When *enabled*, the keystroke repeat rate is determined by the typematic rate and typematic delay parameters.

Typematic Rate (Chars/Sec) When the typematic rate setting is enabled, the rate at which characters repeat when keys are held down is determined by this setting. The possible settings are 6, 8, 10, 12, 15, 20, 24, or 30 characters per seconds.

Typematic Delay (Msec) When the typematic rate setting is enabled, the delay before keystrokes begin to repeat is determined by this setting. The possible delay settings are 250, 500, 750, or 1000 ms.

Security Option If a password has been set, this parameter determines whether a password is required every time the system boots, or only when setup is entered. See section 4.4.10 on page 4-69 for information about setting a password.

Write Allocate Support This parameter enables and disables write allocate support. The default setting is *enabled* to improve performance.

PCI/VGA Palette Snoop Leave this setting *disabled*.

OS Select for DRAM > 64MB Select *OS2* only if running OS/2 with greater than 64 Mbytes of memory.

Shadow Firmware is software that resides in a read-only memory (ROM) chip on a device or the motherboard. The Award BIOS permits shadowing of firmware such as the system BIOS, video BIOS, and similar operating instructions that come with some expansion peripherals (e.g., a SCSI adaptor, a network interface card, etc.).

Shadowing copies firmware from ROM into system RAM allowing the processor to access the firmware instructions through the 16-bit or 32-bit DRAM bus. Firmware not shadowed must be read by the system through the 8-bit X-bus. Shadowing improves the performance of the system BIOS and similar ROM

firmware for expansion peripherals but reduces the amount of high memory (640 Kbytes to 1 Mbyte) available for loading device drivers, etc.

Enable shadowing into each section of memory separately. Video BIOS shadows into memory area C0000-C7FFF. The remaining areas shown on the BIOS features setup screen may be occupied by other expansion card firmware. If an expansion peripheral in the system contains ROM-based firmware, knowing the address range the ROM occupies is necessary to shadow the firmware into the correct area of RAM.

4.4.6 Chipset Features Setup

This section describes setup options for the CS1 chipset. The parameters on this screen are for system designers, service personnel, and technically competent users only. If changes are made to parameters on this screen, the system may operate erratically or fail to boot. Caution should be used when modifying any parameters on this screen. Figure 4-4 shows the parameters available for modification. The values displayed are the default values for all parameters.

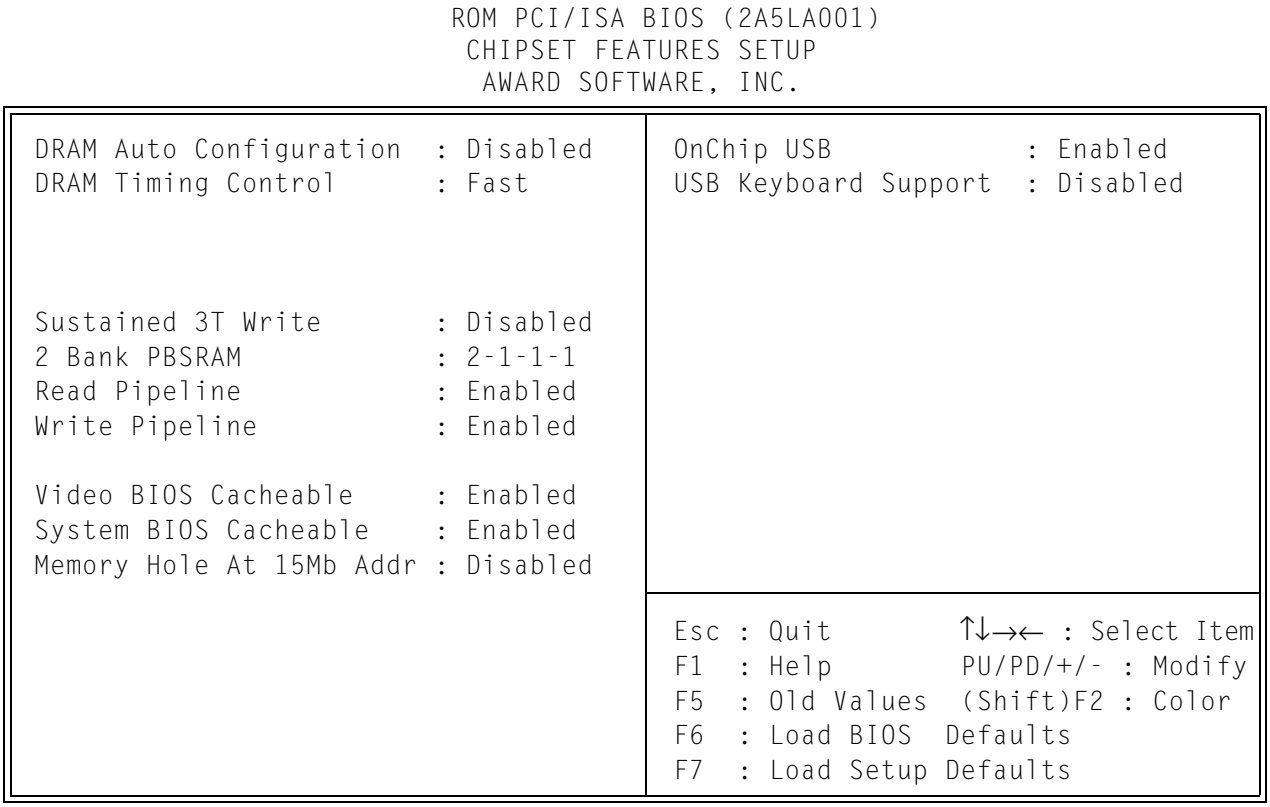


Figure 4-4. Chipset Features Setup Screen

DRAM Auto Configuration When this parameter is *enabled*, DRAM timing is automatically configured for optimal performance. When set to *disabled*, the DRAM timing can be manually adjusted.

DRAM Timing Control

This allows the setting of the memory access timing. The settings are as follows:

- *Normal*
- *Medium*
- *Fast*
- *Turbo*

Sustained 3T Write

Select *enabled* for optimal performance. Enabling this parameter causes back-to-back write cycles to take three processor clocks to complete.

2 Bank PBSRAM

This parameter determines the pipeline timing sequence for cache accesses. The numbers in the sequence represent the number of clock cycles used for each pipeline access. Table 4-6 lists the available settings.

Table 4-6. PBSRAM Settings

Setting	Description
3-1-1-1	The first pipeline access takes three clock cycles. Each subsequent access takes one clock cycle.
2-1-1-1	The first pipeline access takes two clock cycles. Each subsequent access takes one clock cycle.

Read Pipeline

This parameter enables or disables pipeline read operations.

Write Pipeline

This parameter enables or disables pipeline write operations.

Video BIOS Cacheable

Selecting *enabled* allows caching of the video BIOS, resulting in better video performance.

System BIOS Cacheable

Selecting *enabled* allows caching of the system BIOS, resulting in better performance.

Memory Hole at 15Mb Addr

This parameter allows a part of system memory to be reserved for ISA-adapter ROM. When reserved, this area of memory cannot be cached. Peripherals that require this area of system memory usually discuss their memory requirements in the corresponding user documentation.

The available settings are as follows:

- *Disabled*
- *15M–16M*
- *14M–16M*

OnChip USB This parameter enables or disables USB (universal serial bus) support.

USB Keyboard Support When this parameter is *enabled*, a USB keyboard can be used.

4.4.7 Power Management Setup

Power management is implemented in the BIOS by allowing the configuration of the various power management parameters. Figure 4-5 shows the power management setup screen. The values displayed are the default values for all parameters.

```
                    ROM PCI/ISA BIOS (2A5LA001)
                     POWER MANAGEMENT SETUP
                      AWARD SOFTWARE, INC.

Power Management   : Min Saving          IRQ5  (LPT 2)       : Primary
PM Control by APM  : Yes                 IRQ6  (Floppy Disk) : Primary
Video Off Option   : Suspend -> Off      IRQ7  (LPT 1)       : Primary
Video Off Method   : V/H SYNC+BLANK      IRQ8  (RTC Alarm)   : Disabled
Conserve Mode      : Disabled            IRQ9  (IRQ2 Redir)  : Secondary
MODEM Use IRQ      : 3                   IRQ10 (Reserved)    : Secondary
                                         IRQ11 (Reserved)    : Secondary
       ** PM Timers **                   IRQ12 (PS/2 Mouse)  : Primary
HDD Power Down     : Disabled            IRQ13 (Coprocessor) : Primary
Doze Mode          : 1 Hour              IRQ14 (Hard Disk)   : Primary
Suspend Mode       : 1 Hour              IRQ15 (Reserved)    : Primary

       ** PM Events **
VGA                : OFF
LPT & COM          : LPT/COM
HDD & FDD          : ON                  Esc : Quit        ↑↓→← : Select Item
DMA/master         : OFF                 F1  : Help        PU/PD/+/- : Modify
Primary INTR       : ON                  F5  : Old Values  (Shift)F2 : Color
IRQ3 (COM 2)       : Primary             F6  : Load BIOS  Defaults
IRQ4 (COM 1)       : Primary             F7  : Load Setup Defaults
```

Figure 4-5. Power Management Setup Screen

Power Management This parameter allows the selection of the type (or degree) of power saving. See the PM Timers section on page 4-61 for a description of the doze and suspend modes. Table 4-7 defines the available settings.

Table 4-7. Available Power Management Settings

Setting	Description
Disable	Disables power management.
Min Saving	Minimum power management. Inactivity periods of the doze and suspend modes are one hour each.
Max Saving	Maximum power management. This setting is only available for SL-type processors. Inactivity periods for the Doze and Suspend modes are one minute each.
User Define	This setting allows the user to set each mode individually. When not disabled, each activity period ranges from one minute to one hour. Time-out periods are selected in the PM Timers section of the screen.

PM Control by APM

If APM is installed, selecting *yes* gives better power savings.

Video Off Option

Use this parameter to select the power saving modes during which the monitor goes blank. Table 4-8 lists the available settings.

Table 4-8. Available Video-Off Options

Option	Description
Always On	Monitor remains on during power-saving modes.
Suspend --> Off	Monitor blanked when system enters the suspend mode.
All Modes --> Off	Monitor blanked when system enters any power-saving mode.

Video Off Method

This parameter determines the manner in which the monitor is blanked during power-saving modes. Table 4-9 lists the available options.

Table 4-9. Available Video-Off Methods

Method	Description
V/H SYNC+Blank	System turns off vertical and horizontal synchronization ports and writes blanks to the video buffer.
DPMS Support	Select this option if the monitor supports the Display Power Management Signaling (DPMS) standard of the Video Electronics Standards Association (VESA). Use the software supplied with the video subsystem to select video power management values.
Blank Screen	System only writes blanks to the video buffer.

Conserve Mode

Setting this parameter to *enabled* slows the effective processor speed to 8 MHz, leaving all other system parameters unchanged.

PM Timers

The following modes are green PC power saving functions that can be enabled or disabled only during user defined power management mode.

HDD Power Down. After the selected period of drive inactivity, the hard disk drive powers down while all other devices remain active.

Doze Mode. After the selected period of system inactivity, the processor clock runs at a slower speed while all other devices still operate at full speed.

Suspend Mode. After the selected period of system inactivity, all devices except the processor shut off.

PM Events

A power-management (PM) event awakens the system from, or resets activity timers for, suspend mode. Monitoring of common interrupt requests can be disabled so they do not generate PM events.

VGA. When *on*, any video activity is a PM event.

LPT & COM. When *on*, any activity on the selected port or combination of ports generates a PM event. The possible combinations of ports are as follows:

- *None*
- *LPT*
- *COM*
- *LPT/COM*

HDD & FDD. When *on*, any hard drive or floppy drive activity generates a PM event.

DMA/master. When *on*, any DMA or bus master activity generates a PM event.

Primary INTR. When the system is in Suspend mode, IRQ activity can cause a primary or secondary PM event.

- Primary PM event—the system wakes up fully when it detects an IRQ
- Secondary PM event—the system does not wake up, but the interrupt request is processed. Secondary interrupts are typically housekeeping devices needed to maintain the system while not requiring the use of the rest of the system resources. For example, interrupts 10 and 11 (IRQ10 and IRQ11) are configured *secondary* by default.

When on, the following IRQs can be configured as *primary*, *secondary*, or *disabled*:

- IRQ3 (COM 2)
- IRQ4 (COM 1)
- IRQ5 (LPT 2)
- IRQ7 (LPT 1)
- IRQ8 (RTC Alarm)
- IRQ9 (IRQ2 Redir)
- IRQ10 (Reserved)
- IRQ11 (Reserved)
- IRQ12 (PS/2 Mouse)
- IRQ14 (Hard Disk)
- IRQ15 (Reserved)

4.4.8 PNP/PCI Configuration

The Award BIOS can automatically configure all the boot and Plug and Play-compatible devices. Using this configuration screen, the devices can also be manually configured. Figure 4-6 shows the PNP/PCI configuration screen.

```
                    ROM PCI/ISA BIOS (2A5LA001)
                     PNP/PCI CONFIGURATION
                      AWARD SOFTWARE, INC.

Resources Controlled By  : Manual          CPU to PCI Write Buffer  : Enabled
Reset Configuration Data : Disabled        PCI Dynamic Bursting     : Enabled
                                           PCI Master 0 WS Write    : Enabled
IRQ-3  assigned to : Legacy ISA            PCI Peer Concurrency     : Enabled
IRQ-4  assigned to : Legacy ISA            PCI Delay Transaction    : Enabled
IRQ-5  assigned to : PCI/ISA PnP
IRQ-7  assigned to : Legacy ISA            PCI IRQ Actived By  : Level
IRQ-9  assigned to : PCI/ISA PnP           PCI IDE IRQ Map To  : ISA
IRQ-10 assigned to : PCI/ISA PnP
IRQ-11 assigned to : PCI/ISA PnP
IRQ-12 assigned to : PCI/ISA PnP
IRQ-14 assigned to : Legacy ISA
IRQ-15 assigned to : Legacy ISA
DMA-0  assigned to : PCI/ISA PnP
DMA-1  assigned to : PCI/ISA PnP
DMA-3  assigned to : PCI/ISA PnP           Esc : Quit        ↑↓→← : Select Item
DMA-5  assigned to : PCI/ISA PnP           F1  : Help        PU/PD/+/- : Modify
DMA-6  assigned to : PCI/ISA PnP           F5  : Old Values  (Shift)F2 : Color
DMA-7  assigned to : PCI/ISA PnP           F6  : Load BIOS  Defaults
                                           F7  : Load Setup Defaults
```

Figure 4-6. PNP/PCI Configuration Screen

Resources Controlled By

The Award Plug and Play BIOS can automatically configure all the boot and Plug and Play-compatible devices. If this parameter is set to *auto*, all the interrupt request (IRQ) and DMA assignment fields are not displayed, as the BIOS automatically assigns the IRQ and DMA resources.

Reset Configuration Data

Normally, this field is left *disabled*. If a new add-on device is added to the system that causes such a serious conflict that the operating system cannot boot, select *enabled* to reset extended system configuration data (ECSD) upon rebooting the system.

IRQ n Assigned To

When resources are controlled manually, assign each system interrupt as one of the following types, depending on the type of device using the interrupt:

- *Legacy ISA*—devices compliant with the original PC AT bus specification, requiring a specific interrupt (such as IRQ4 for serial port 1)
- *PCI/ISA PnP*—devices compliant with the Plug and Play standard, whether designed for PCI or ISA bus architecture

DMA n Assigned To

When resources are controlled manually, assign each system DMA channel as one of the following types, depending on the type of device using the interrupt:

- *Legacy ISA*—devices compliant with the original PC AT bus specification, requiring a specific DMA channel
- *PCI/ISA PnP*—devices compliant with the Plug and Play standard, whether designed for PCI or ISA bus architecture

CPU to PCI Write Buffer

When this parameter is *enabled*, writes from the processor to the PCI bus are buffered to compensate for the speed differences between the processor and the PCI bus. When disabled, the writes are not buffered and the processor must wait until the write is complete before starting another write cycle.

PCI Dynamic Bursting

Setting this parameter to *enabled* causes PCI transfers to/from the processor to be bursted whenever possible.

PCI Master 0 WS Write

When *enabled*, writes to the PCI bus are executed with zero wait states.

PCI Peer Concurrency

When this parameter is *enabled*, a data transfer to a PCI device occurs without tying up either memory or the processor busses. When *disabled*, memory is assigned to the PCI port.

PCI Delay Transaction

This parameter enables 1-wait-state PCI transfers. When *enabled*, PCI transfers are delayed by one clock cycle.

PCI IRQ Actived By

Leave the IRQ trigger set at *level* unless the PCI device assigned to the interrupt specifies Edge-triggered interrupts.

PCI IDE IRQ Map to This parameter allows selecting either PCI IDE IRQ mapping or PC AT (ISA) interrupts. The possible selections are as follows:

- *ISA*
- *PCI-Slot 1*
- *PCI-Slot 2*
- *PCI-Slot 3*
- *PCI-Slot 4*
- *PCI Auto*

When any value other than ISA is selected, the following two additional parameters can be configured:

- Primary IDE INT#
- Secondary IDE INT#

Each PCI peripheral connection is capable of activating up to four interrupts: INT# A, INT# B, INT# C and INT# D. By default, a PCI connection is assigned INT# A. Assigning INT# B has no meaning unless the peripheral device requires two interrupt services rather than just one. Because the PCI IDE interface in the chipset has two channels, it requires two interrupt services. The primary and secondary IDE INT# fields default to values appropriate for two PCI IDE channels, with the primary PCI IDE channel having a lower interrupt than the secondary.

4.4.9 Integrated Peripherals

The integrated peripherals setup allows the configuration of the following onboard controllers:

- IDE
- FDC (flexible disk controller)
- Serial ports
- Sound
- Video

Figure 4-7 shows the integrated peripherals setup screen. The values displayed are the default values for all parameters.

```
                    ROM PCI/ISA BIOS (2A5LA001)
                     INTEGRATED PERIPHERALS
                      AWARD SOFTWARE, INC.

OnChip IDE First Channel : Enabled      Onboard Sound Controller  : Enabled
OnChip IDE Second Channel: Enabled      IDE Primary Master UDMA   : Auto
IDE Prefetch Mode        : Enabled      IDE Primary Slave  UDMA   : Auto
IDE Primary Master PIO   : Auto         IDE Secondary Master UDMA : Auto
IDE Primary Slave  PIO   : Auto         IDE Secondary Master UDMA : Auto
IDE Secondary Master PIO : Auto
IDE Secondary Slave  PIO : Auto

Onboard FDC Controller   : Enabled
Onboard UART 1           : 3F8/IRQ4
Onboard UART 2           : 2F8/IRQ3
Onboard UART 2 Mode      : HPSIR
IR Duplex Mode           : Half
Use IR Pins              : IR-RX2TX2
Onboard Parallel Port    : 378/IRQ7     Esc : Quit        ↑↓→← : Select Item
Parallel Port Mode       : ECP+EPP      F1  : Help        PU/PD/+/- : Modify
ECP Mode Use DMA         : 3            F5  : Old Values  (Shift)F2 : Color
Parallel Port EPP Type   : EPP1.7       F6  : Load BIOS  Defaults
                                        F7  : Load Setup Defaults
```

Figure 4-7. Integrated Peripherals Setup Screen

OnChip IDE First/ Second Channel

The CS1 chipset contains a PCI IDE interface with support for two IDE channels. Select *enabled* to activate the first and/or the second IDE interface. If an add-in IDE controller is installed as either the primary or secondary IDE interface, select *disabled* to deactivate the appropriate onboard channel.

IDE Prefetch Mode

The onboard IDE controller supports IDE prefetching for faster drive accesses. If an add-in IDE controller is installed as either the primary or secondary IDE interface and the add-in IDE controller does not support prefetching, set this parameter to *disabled*.

IDE Primary/Secondary Master/Slave PIO

The four IDE PIO (programmed input/output) parameters allow setting a PIO mode (0-4) for each of the four IDE devices supported by the onboard IDE interface. Modes 0 through 4 provide successively increased performance. In auto mode, the system automatically determines the best mode for each device.

Onboard FDC Controller

If an add-in floppy disk controller is installed or the system has no floppy drive, set this parameter to disabled.

Onboard UART 1/2

Select a logical COM port address for the first and second serial ports.

Onboard UART 2 Mode

The following modes are supported:

- *Standard*—the second serial port operates as a normal COM port
- *HPSIR*—the second serial port operates as an IrDA-compliant infrared port
- *ASKIR*—the second serial port operates as an amplitude shift keyed infrared port

If HPSIR or ASKIR mode is chosen, two additional parameters are displayed.

IR Duplex Mode. Select either half or full duplex mode for the infrared port.

Use IR Pins. Select either *IR-RX2TX2* or *IR-RXTX* to use either the first or second transmit/receive pair of pins for the infrared port.

Onboard Parallel Port

Select a logical LPT port address for the physical parallel (printer) port. The available choices are as follows:

- *Disabled*
- *378/IRQ7*
- *3BC/IRQ7*
- *278/IRQ5*

Parallel Port Mode

Select an operating mode for the onboard parallel port. Select normal unless both the hardware and software support EPP or ECP mode. Table 4-10 lists the available options.

Table 4-10. Available Parallel Port Modes

Mode	Description
Normal	PC AT parallel port
EPP (Extended Parallel Port)	Bidirectional port
ECP (Extended Capabilities Port)	Fast, buffered port
ECP+EPP	Fast, buffered, bidirectional port

ECP Mode Use DMA

When ECP mode is enabled, select a DMA channel for the parallel port. The default is DMA channel 1.

Parallel Port EPP Type

When EPP mode is enabled, select EPP port type 1.7 or 1.9. The default is EPP port type 1.7.

Onboard Sound Controller

Select either *enabled* or *disabled* to turn the onboard sound controller on or off.

IDE Primary/Secondary Master/Slave UDMA

This parameter enables the use of the new UDMA (ultra direct memory access) IDE mode. This mode is similar to mode 4, but supports data transfer speeds up to 33 MBytes/sec. When this parameter is set to *auto*, the UDMA mode is enabled if both the IDE controller and the IDE drive support UDMA.

4.4.10 Password Setting

This function allows a password to be entered, changed, or cleared as listed in the following procedures.

Entering/Modifying A Password

1. Select the password setting function from the main menu.
   When this function is selected from the main menu, a message is displayed at the center of the screen:

   ```
   ENTER PASSWORD:
   ```

2. Type the password, up to eight characters.
   Typing a password clears any previously-entered password from CMOS memory.
3. Press the <Enter> key.
   After pressing the <Enter> key, the following message is displayed:

   ```
   CONFIRM PASSWORD:
   ```

4. Type the password again.
5. Press the <Enter> key.

To abort the process at any time, press the <Esc> key.

Clearing the Password

1. Select the Password Setting function from the main menu.
   When this function is selected from the main menu, a message is displayed at the center of the screen:

   ```
   ENTER PASSWORD:
   ```

2. Press the <Enter> key without entering a password.
   This disables the password function.

4.5 POST Messages

During POST, the BIOS either sounds a beep code or displays a message when a correctable error is detected. An error message is followed by the following message:

```
PRESS F1 TO CONTINUE, CTRL-ALT-ESC OR DEL TO ENTER SETUP
```

4.5.1 POST Beep Messages

Currently the only beep code indicates that a video error has occurred and the BIOS cannot initialize the video screen to display any additional information. This beep code consists of a single long beep followed by two short beeps.

4.5.2 POST Error Messages

The following is an alphabetical list of POST error messages for the ISA BIOS.

CMOS BATTERY HAS FAILED

CMOS battery is no longer functional. The battery should be replaced.

CMOS CHECKSUM ERROR

Checksum of CMOS is incorrect. This can indicate that CMOS is corrupted. This error can be caused by a weak battery. Check the battery and replace if necessary.

DISK BOOT FAILURE, INSERT SYSTEM DISK AND PRESS RETURN

No boot device was found. This could mean that either a boot drive was not detected or the drive does not contain proper system boot files. Insert a system disk into drive A: and press the <Enter> key. If the system is set up to boot from the hard drive, make sure all cables are properly attached. If using an add-in hard drive controller, make sure the controller card is installed correctly. Also make sure the disk is formatted as a boot device. Then reboot the system.

DISKETTE DRIVES OR TYPES MISMATCH ERROR - RUN SETUP

The type of diskette drive installed in the system is different from the CMOS definition. Run setup to reconfigure the drive type correctly.

DISPLAY TYPE HAS CHANGED SINCE LAST BOOT

Since last powering off the system, the display adapter has been changed. The system must be configured for the new display type.

ERROR ENCOUNTERED INITIALIZING HARD DRIVE

The hard drive cannot be initialized. If using an add-in controller, make sure the controller card is installed correctly. Check that all cables are correctly and firmly attached. Also make sure the correct hard drive type is selected in setup.

ERROR INITIALIZING HARD DISK CONTROLLER

The hard drive controller cannot be initialized. If using an add-in controller, make sure the card is correctly and firmly installed. Make sure the correct hard drive type is selected in Setup. Also check to see that the hard drive jumpers are configured correctly.

FLOPPY DISK CNTRLR ERROR OR NO CNTRLR PRESENT

Cannot find or initialize the floppy drive controller. If using an add-in controller, make sure the card is correctly and firmly installed. If there are no floppy drives installed, make sure the diskette drive selection in setup is set to *none*.

KEYBOARD ERROR OR NO KEYBOARD PRESENT

Cannot initialize the keyboard. Make sure the keyboard is attached correctly and no keys are being pressed during the boot.

If the system is purposely configured without a keyboard, set the error halt condition in setup to *halt on all but keyboard*. This

setting causes the BIOS to ignore the missing keyboard and continue the boot.

Memory Address Error at ...

This error indicates a memory address error at a specific location. If this location and the memory map for the system are known, the bad memory SIMMS can be found and replaced.

MEMORY SIZE HAS CHANGED SINCE LAST BOOT

Memory has been added or removed since the last boot. Enter setup and choose *save and exit setup* to update the memory size in CMOS memory.

Memory Verify Error at ...

Indicates an error verifying a value already written to memory. Use the location and the system memory map to locate the bad SIMM.

OFFENDING ADDRESS NOT FOUND

This message is used in conjunction with the I/O CHANNEL CHECK and RAM PARITY ERROR messages when the segment that has caused the problem cannot be isolated.

OFFENDING SEGMENT:

This message is used in conjunction with the I/O CHANNEL CHECK and RAM PARITY ERROR messages when the segment that caused the problem has been isolated.

PRESS A KEY TO REBOOT

This message is displayed at the bottom of the screen when an error occurs that requires a system reboot. Press any key to reboot the system.

PRESS F1 TO DISABLE NMI, F2 TO REBOOT

When the BIOS detects a non-maskable interrupt condition during boot, NMI can be disabled and the boot continued, or the system can be rebooted with the NMI enabled.

RAM PARITY ERROR - CHECKING FOR SEGMENT ...

Indicates a parity error in Random Access Memory.

SYSTEM HALTED, (CTRL-ALT-DEL) TO REBOOT ...

Indicates the present boot attempt has been aborted and the system must be rebooted. Press <Ctrl><Alt><Del> to reboot the system.

4.6 POST Codes

Table 4-11 list the Award BIOS POST codes. Only the ISA-bus POST codes are included in the table.

Note: *ISA POST codes are output to port address 80h.*

Table 4-11. Award BIOS POST Codes

Code (Hex)	Name	Description
C0	Turn Off Chipset Cache	OEM-specific cache control
1	Processor Test 1	Processor Status (1FLAGS) Verification Tests the carry, zero, sign, and overflow status flags by setting each flag, verifying it is set, turning each off, and verifying it is off
2	Processor Test 2	Read/Write/Verify all CPU registers except SS, SP, and BP with data pattern FF and 00
3	Initialize Chips	Disable NMI, PIE, AIE, UEI, and SQWV Disable video, parity checking, and DMA Reset math coprocessor Clear all page registers and CMOS shutdown byte Initialize timer 0, 1, and 2 Initialize DMA controllers 0 and 1 Initialize interrupt controllers 0 and 1
4	Test Memory Refresh Toggle	RAM must be periodically refreshed to keep the memory from decaying. This function assures that the memory refresh function is working properly.
5	Blank Video, Initial Keyboard	Keyboard controller initialization
6	Reserved	
7	Test CMOS Interface and Battery Status	Verifies that CMOS is working correctly and detects a bad battery
BE	Chipset Default Initialization	Program the chipset registers with the power-on BIOS defaults
C1	Memory Presence Test	OEM-specific test to size onboard memory
C5	Early Shadow	OEM-specific early-shadow enable for fast boot
C6	Cache Presence Test	External cache size detection

Table 4-11. Award BIOS POST Codes (continued)

Code (Hex)	Name	Description
8	Setup Low Memory	Early chip set initialization Memory presence test OEM chip set routines Clear low 64 Kbytes of memory Test first 64 Kbytes of memory
9	Early Cache Initialization	Cache initialization
A	Setup Interrupt Vector Table	Initialize the first 120 interrupt vectors with SPURIOUS_INT_HANDLER and initialize INT 00h–1Fh according to INT_TBL
B	Test CMOS Ram Checksum	Test the CMOS RAM checksum, and if bad, or the <Ins> key is pressed, load the defaults
C	Initialize Keyboard	Detect the type of keyboard controller(optional) and set the NUM_LOCK status
D	Initialize Video Interface	Detect the CPU clock Read CMOS location 14h to find out the type of video in use Detect and initialize the video adapter
E	Test Video Memory	Test video memory and write the sign-on message to the screen Setup the shadow RAM—enable shadow according to setup
F	Test DMA Controller 0	BIOS checksum test Keyboard detect and initialization
10	Test DMA Controller 1	
11	Test DMA Page Registers	Test the DMA page registers
12–13	Reserved	
14	Test Timer Counter 2	Test the 8254 Timer 0, Counter 2
15	Test 8259-1 Mask Bits	Verify 8259 Channel 1 masked interrupts by alternately turning off and on the interrupt lines
16	Test 8259-2 Mask Bits	Verify 8259 Channel 2 masked interrupts by alternately turning off and on the interrupt lines
17	Test Stuck 8259's Interrupt Bits	Turn off interrupts then verify that no interrupt mask register is on
18	Test 8259 Interrupt Functionality	Force an interrupt and verify that the interrupt occurred
19	Test Stuck NMI Bits (Parity/IO Check)	Verify that NMI can be cleared
1A		Display the CPU clock
1B–1E	Reserved	

Table 4-11. Award BIOS POST Codes (continued)

Code (Hex)	Name	Description
30	Size Base And Extended Memory	Size base memory from 256 Kbytes to 640 Kbytes and extended memory above 1 Mbyte
31	Test Base And Extended Memory	Test base memory from 256 Kbytes to 640 Kbytes and extended memory above 1 Mbyte using various patterns *Note: This test can be skipped by pressing the <Esc> key.*
33–3B	Reserved	
3C	Setup Enabled	
3D	Initialize & Install Mouse	Detect if a mouse is present, initialize the mouse, and install the mouse interrupt vectors
3E	Setup Cache Controller	Initialize the cache controller
3F	Reserved	
BF	Chipset Initialization	Program the chipset registers with setup values
40		Display virus protect disable or enable
41	Initialize Floppy Drive & Controller	Initialize the floppy disk drive controller and any drives
42	Initialize Hard Drive & Controller	Initialize the hard drive controller and any drives
43	Detect & Initialize Serial/parallel Ports	Initialize any serial and parallel ports (also the game port)
44	Reserved	
45	Detect & Initialize Math Coprocessor	Initialize the math coprocessor
46–4D	Reserved	
4E	Manufacturing Post Loop Or Display Messages	Reboot if the Manufacturing POST Loop pin is set. Otherwise, display any messages (i.e., any non-fatal errors that were detected during POST) and enter Setup.
4F	Security Check	Ask password security (optional)
50	Write CMOS	Write all CMOS values back to RAM and clear the screen
51	Pre-boot Enable	Enable the parity checker, NMI, and cache before boot
52	Initial Option ROMs	Initialize any option ROMs present from C8000h to EFFFFh *Note: When FSCAN option is enabled, ROMs initialize from C8000h to F7FFFh.*
53	Initialize Time Value	Initialize the time value in 40h: BIOS area
60	Setup Virus Protect	Setup the virus protection according to Setup
61	Set Boot Speed	Set the system speed for boot
62	Setup NumLock	Setup NumLock status according to setup
63	Boot Attempt	Set low stack and boot via INT 19h
B0	Spurious	If interrupt occurs in protected mode
B1	Unclaimed NMI	If an unmasked NMI occurs, display `PRESS F1 TO DISABLE NMI, F2 TO REBOOT`

Table 4-11. Award BIOS POST Codes (continued)

Code (Hex)	Name	Description
E1–EF	Setup Pages	E1—page 1, E2—page 2, etc.
FF	Boot	

4.7 Award BIOS Flash Upgrade Utility

The AMD Smoky Mountain motherboard uses the AMD 29F002T flash memory chip to store the BIOS code. The flash BIOS can be upgraded using the Award BIOS Flash Upgrade Utility program (the filename of the utility program is *awdflash.exe*). This section briefly describes the flash upgrade utility and contains instructions on its use.

In the examples given here, the file name *newbios.bin* is used to represent the new BIOS and the file name *oldbios.bin* is used to represent the old BIOS.

Awdflash.exe commands are not case-sensitive. Mixed-case letters are used in the command examples for clarity only.

4.7.1 Before Running The Program

The upgrade process requires two files:

- The new BIOS file (newbios.bin)
- The upgrade utility (awdflash.exe)

Although different media can conceivably be used for the files, this section assumes that the files are on floppy disks. Perform the following procedure to prepare for the BIOS upgrade.

1. Create a bootable floppy disk.
2. Transfer the two Award files listed above onto the disk prepared in step 1.

The upgrade process can be now started.

Note: ***DO NOT*** *interrupt the upgrade program while it is running! Interrupting the program leaves the system without a BIOS,*

rendering it unusable. If the power goes off during the few seconds the program requires to run, the system is left without a working BIOS and needs a correctly-programmed flash EPROM installed before the system can boot again.

4.7.2 Running The Program

The following steps describe a procedure to upgrade a flash BIOS.

1. Boot the system from the bootable floppy disk created in the preceding section.

   Booting from the floppy disk bypasses loading drivers from the CONFIG.SYS and AUTOEXEC.BAT files on the hard drive, eliminating the possibility of loading a program that conflicts with the flash upgrade utility.

Note: *The Award flash utility cannot run when EMM386 or QEMM are loaded. An error message is displayed if this is attempted.*

2. At the DOS command line, type `AWDFLASH` and press the `<Enter>` key.

   A screen similar to Figure 4-8 is displayed:

```
                    FLASH MEMORY WRITER v5.3x
          Copyright© 1996, Award Software International, Inc.

        For I430HX-xxxxxxxx                        DATE: 06/18/96
          Flash Type -

        File Name to Program:
```

Figure 4-8. Flash Update Program Screen

   The cursor should be opposite `File Name to Program:`

3. Enter the name of the new BIOS file.

   Type `NEWBIOS.BIN` and press the `<Enter>` key.

   At the bottom of the screen, this prompt is displayed:

   ```
   Do You Want to Save BIOS (Y/N)?
   ```

4. If you **DO NOT** want to save the old BIOS, enter `N` and press the `<Enter>` key. Then skip to step 6.

   If you **DO** want to save the old BIOS, enter `Y` and press the `<Enter>` key.

5. In the `File Name to Save` field, enter a file name for the old BIOS (for example, `OLDBIOS.BIN`) and press the `<Enter>` key.

   The old BIOS is saved in the default drive and directory (in this example, drive A) with the filename entered.

6. The following prompt is displayed:

   ```
   Do You Want to Update? (Y/N)
   ```

   If you **DO NOT** want to update the BIOS, type `N` and press the `<Enter>` key. The program exits to the command line. Skip step 7.

If you **DO** want to update the BIOS, enter `Y` and press the `<Enter>` key. When the BIOS is updated, the following message is displayed:

```
Programming Flash Memory - 3FFFF OK

Please Power off or Reset System
```

7. Reboot the system. The BIOS should be successfully updated.

4.7.3 Flash Upgrade Utility Command Line Parameters

The flash upgrade utility can be run from the DOS command line. This section describes the command line parameters and switches and provides examples of their usage.

To obtain a complete list of the parameters available in the version of the utility in use, enter the following command at the DOS prompt followed by the `<Enter>` key:

```
AWDFLASH /?
```

A screen similar to Figure 4-9 is displayed.

```
                FLASH MEMORY WRITER v5.3x
        Copyright© 1996, Award Software International, Inc.

     AWDFLASH [(FLASH)[PATH][FILENAME]] [/Py,Pn]
          [(SAVE)[PATH][FILENAME]] [/Sy,Sn]
          [(CLEAR CMOS)[/CC]] [(CLEAR PnP)[/CP]]
          [(CLEAR DMI)[/CD]] [/?]

     [Py/Pn] PROGRAM BIOS ANSWER Y or N.
     [Sy/Sn] SAVE OLDBIOS ANSWER Y or N.
     [/?] FOR HELP !
     EXAMPLE 1 : AWDFLASH NEWBIOS /Py SAVEBIOS /Sy
     EXAMPLE 2 : AWDFLASH NEWBIOS SAVEBIOS /CC
     EXAMPLE 3 : AWDFLASH NEWBIOS /Sn /CN
     EXAMPLE 4 : AWDFLASH /Pn SAVEBIOS /CC /CD
```

Figure 4-9. Flash Utility Available Options

Save/Update

`/P`	Program (update) BIOS	switch `y` or `n`
`/S`	Save old BIOS	switch `y` or `n`

Example 1. To program a new BIOS and save the old BIOS, enter the following command and press the <Enter> key:

```
AWDFLASH newbios.bin /Py oldbios.bin /Sy
```

The program saves the old BIOS to the file as named and updates the BIOS with the new BIOS.

Example 2. To program a new BIOS without saving the old BIOS, enter the following command and press the <Enter> key:

```
AWDFLASH newbios.bin /Sn
```

After executing this command, the program displays the following prompt:

```
Do You Want to Update? (Y/N)
```

Type Y in response.

Example 3. To save the old BIOS to a file without updating it, enter the following command and press the <Enter> key:

```
AWDFLASH /Pn oldbios.bin /Sy
```

Clear Data

The Award flash utility version 5.31 and above contains three additional command line parameters:

/CC	Clear CMOS
/CP	Clear PnP data (ESCD)
/CD	Clear DMI data